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ABSTRACT

In 1990, the National Assessment of Educational Progress (NAEP) included a Trial State Assessment which, for the first time in the NAEP's history, made voluntary state-by-state assessments. This 1992 mathematics report marks the first attempt of the National Center for Education Statistics to shift to standards-based reporting of National Assessment statistics. NAEP results are reported by achievement levels which are descriptions of how students should perform relative to a body of content reflected in the NAEP frameworks; in other words, how much students should know. The 1992 assessment covered six mathematics content areas: (1) numbers and operations; (2) measurement; (3) geometry; (4) data analysis, statistics, and probability; (5) algebra and functions; and (6) estimation. In Pennsylvania, 2,740 fourth-grade students in 111 public schools and 2,640 eighth-grade students in 99 public schools were assessed. This report describes the mathematics performance of Pennsylvania fourth- and eighth-grade students in public schools and compares their overall performance to students in the Northeast region of the United States and the nation. The distribution of the results are provided for subpopulations of students including race/ethnicity; type of community--advantaged/disadvantaged urban, extreme rural, and other; parents' education level; gender; and content area performance. To provide a context for understanding students' mathematics proficiency, students, their mathematics teachers, and principals completed questionnaires which focused on: what are students taught? (curriculum coverage, homework, and instructional emphasis); how is mathematics instruction delivered?

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(resources, collaborating in small groups, using mathematical objects, and materials); how are calculators and computers used? (access and use of calculators, availability of computers, and when to use a calculator); who is teaching mathematics? (educational background); and conditions beyond school that facilitate mathematics learning and teaching (amount of reading materials in the home, hours of television watched per day, student absenteeism, and students' perceptions of mathematics). The average proficiency of fourth-grade students in Pennsylvania on the NAEP mathematics scale was 223 compared to 217 nationwide; for Pennsylvania eighth-grade students the average proficiency was 271 compared to 266 nationwide. (ASK)

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NAEP 1992 Mathematics State Report for Pennsylvania

The Trial State Assessment Program

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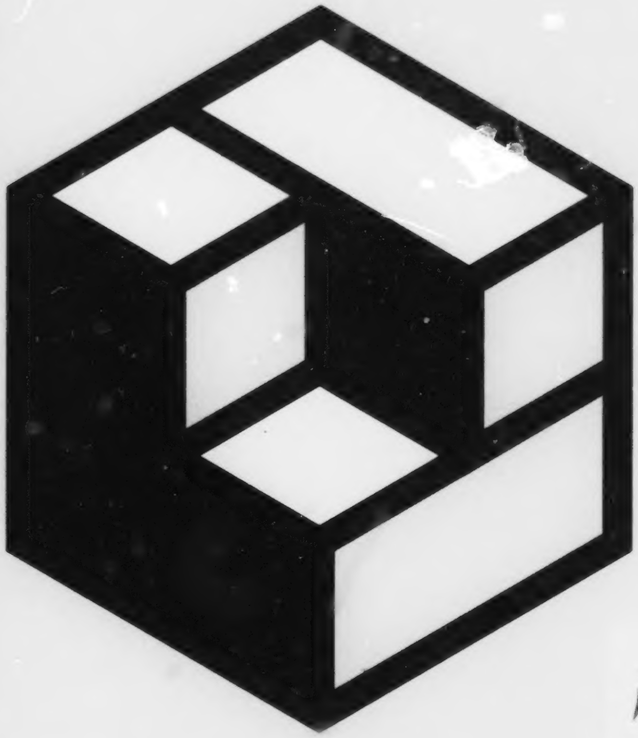

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SE053146

What is The Nation's Report Card?

THE NATION'S REPORT CARD, the National Assessment of Educational Progress (NAEP), is the only nationally representative and continuing assessment of what America's students know and can do in various subject areas. Since 1969, assessments have been conducted periodically in reading, mathematics, science, writing, history/geography, and other fields. By making objective information on student performance available to policymakers at the national, state, and local levels, NAEP is an integral part of our nation's evaluation of the condition and progress of education. Only information related to academic achievement is collected under this program. NAEP guarantees the privacy of individual students and their families.

NAEP is a congressionally mandated project of the National Center for Education Statistics, the U.S. Department of Education. The Commissioner of Education Statistics is responsible, by law, for carrying out the NAEP project through competitive awards to qualified organizations. NAEP reports directly to the Commissioner, who is also responsible for providing continuing reviews, including validation studies and solicitation of public comment, on NAEP's conduct and usefulness.

In 1988, Congress created the National Assessment Governing Board (NAGB) to formulate policy guidelines for NAEP. The board is responsible for selecting the subject areas to be assessed, which may include adding to those specified by Congress; identifying appropriate achievement goals for each age and grade; developing assessment objectives; developing test specifications; designing the assessment methodology; developing guidelines and standards for data analysis and for reporting and disseminating results; developing standards and procedures for interstate, regional, and national comparisons; improving the form and use of the National Assessment; and ensuring that all items selected for use in the National Assessment are free from racial, cultural, gender, or regional bias.

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NAEP 1992
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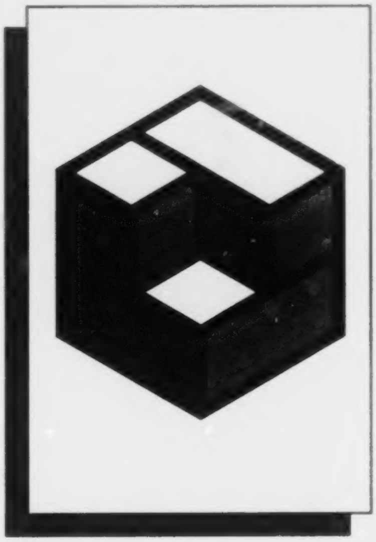
The Trial State Assessment Program



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April 1993

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THE NATION'S
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INTRODUCTION

The National Assessment of Educational Progress (NAEP) is a Congressionally mandated project of the National Center for Education Statistics (NCES) that has collected and reported information for nearly 25 years on what American students know and what they can do. It is the nation's only ongoing, comparable, and representative assessment of student achievement. Its tests are given to scientific samples of youths attending both public and private schools and enrolled in grades four, eight, or twelve. The test items are written around a framework prepared for each content area -- reading, writing, mathematics, science, and others -- that represents the consensus of groups of curriculum experts, educators, members of the general public, and user groups on what should be covered on such a test. Reporting includes means and distributions of scores, as well as more descriptive information about the meaning of different points on the NAEP scale.

A Recent History of NAEP Reporting

Over time there have been many changes in emphasis of NAEP testing and reporting both to take advantage of new technologies and to reflect changing trends in education. In 1984, a new technology called Item Response Theory (IRT) made it possible to create "scale scores" for NAEP similar to those the public was accustomed to seeing for the annual Scholastic Aptitude Tests (SAT). Educational Testing Service, in its role as Government grantee carrying out NAEP operations, devised a new way to describe performance against this scale, called "anchor levels." Starting in 1984, NAEP results were reported by "anchor levels." Anchor levels describe distributions of performance at selected points along the NAEP scale (i.e., standard deviation units). Anchor levels show how groups of students perform relative to each other, but not whether this performance is adequate.

In 1988, Congress authorized a new aspect of NAEP that allowed states and territories to participate voluntarily in a trial state assessment, using samples representative of their own students, to provide state-level data comparable to the nation and each of the other participating jurisdictions. Pursuant to that law, in 1990, the mathematics achievement of eighth graders was assessed in 40 jurisdictions (states, territories, and the District of Columbia). The results were reported in *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States* (Washington, DC: National Center for Education Statistics, 1991).

In the same 1988 law, Congress established the National Assessment Governing Board (NAGB), assigning it broad policy making authority over NAEP, including the authority to take "appropriate actions . . . to improve the form and use of the National Assessment" and to identify "appropriate achievement goals for each . . . grade and subject area to be tested in the National Assessment." To carry out its responsibilities, NAGB developed achievement levels, which are collective judgments about how students *should* perform, translated into ranges along the NAEP scale. The process was conducted for NAGB under contract by American College Testing (ACT), which has extensive experience in standard-setting in many fields. The standards setting process began with questions such as, "What *should* students know and be able to do if they are **proficient** in mathematics in the fourth, eighth, or twelfth grade?" The National Assessment Governing Board, after wide consultation including public hearings, developed statements to describe what students should know and be able to do at three levels of proficiency -- "Basic," "Proficient," and "Advanced" -- for each of the three NAEP grades. A panel of expert and broadly representative judges evaluated each NAEP item, judged the proportion of students at each level which should answer the items correctly, and made recommendations that resulted in points along the NAEP scale that corresponded with the minimum score for each of these levels.

In 1990, after Congress had mandated pilot testing at the State level to supplement what had only been conducted for the Nation and four large regions, the more rigorous content of the mathematics standards prepared by the National Council of Teachers of Mathematics began to influence the NAEP frameworks.

Also in 1990, the President and the nations's 50 governors adopted six National Education Goals, including one that calls for American students to "leave grades 4, 8, and 12 having demonstrated competency in challenging subject matter, including English, mathematics, science, history, and geography." The adoption of this goal highlighted a perceived deficiency in the Nation's ability to report on the performance of students relative to standards developed through a consensus process.

A Transition Phase in Reporting

This 1992 mathematics report marks NCES's first attempt to shift to standards-based reporting of National Assessment statistics. The transition is being made now to report NAEP results by "achievement levels." Achievement levels describe how students should perform relative to a body of content reflected in the NAEP frameworks (i.e., how *much* students should know). The impetus for this shift lies in the belief that NAEP data will take on more meaning for the public if they show what proportion of our youth are able to meet standards of performance necessary for a changing world. Chapter 1 of the report describes how the 1992 standards were prepared and provides examples of test exercises that illustrate the mathematics content reflected in the descriptions of the NAEP achievement levels.

Reporting NAEP results on the basis of achievement levels represents a significant change in practice for NCES. On occasion, this agency makes use of emerging analytical approaches that permit new, and sometimes controversial, analyses to be done. Just as other statistical agencies do when introducing new measures to supplement or replace old measures, NCES has in this report provided the data according to the earlier procedures in addition to the new procedures. For this reason, in addition to NAEP results reported according to achievement levels, results according to the scale anchoring procedure that has been used since the 1984 assessment can be found in an appendix to this report. Presenting the data both ways gives the public -- not just technical evaluators -- an opportunity to be informed, so that all data users will be able to assess for themselves how well the various forms of reporting and interpreting the data meet their needs.

Technical Review of NCES Reports

All reports published by NCES are evaluated through an adjudication procedure. This process represents a final quality control check designed to assure that all publications conform to statistical standards, are grounded in the data, and take into account relevant substantive research literature. The adjudication process also attempts to delete misleading interpretive statements, and provide text that is clear and understandable to the American public. During the adjudication of this report neither the process for setting achievement levels developed by ACT nor the scores representing each level was addressed. The process and the cutpoints were taken as a given. The issue of valid inferences was addressed however. A number of reviewers interpreted statements about what students *should* do at the various achievement levels according to the standards set by NAGB as statements about what students *can* do. Independent studies are being conducted concerning the appropriate inferences that can be drawn from the NAEP results reported by achievement levels. Early results from technical evaluations suggested that this apparently logical step in interpretation might not be justified after closer examination of the data about what students at these levels actually demonstrate in terms of mathematical competencies. Discussion about the achievement levels also raised questions about the need for validity evidence for the anchor levels, as well as for greater understanding of the underlying assumptions of the process by which they were developed.[1]

This issue led NCES to seek the advice of several technical committees and to convene a meeting of technical and policy experts. Members, staff, and contractors of the National Assessment Governing Board participated in this meeting. Altogether these activities provided a forum for discussion of various historical and proposed approaches to interpreting the NAEP scale. In order to better inform the public about these and other interpretation issues, a companion NCES report entitled *Interpreting NAEP Scales* (Washington, DC: National Center for Education Statistics, 1993) explains several approaches to reporting information from NAEP.

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[1] R.A. Forsyth. "Do NAEP Scales Yield Valid Criterion-referenced Interpretations?" *Education Measurement: Issues and Practice, 10*, (1991). pp. 3-9, 16.

Actual Student Performance

Then the next question is: Through their performance on the NAEP items, what actual knowledge and abilities did students demonstrate? Chapters 1 - 7 of this report include information on overall means and on distributions of scores, all taken directly from the test item data. The Appendix addresses this question in the manner that NAEP has used since 1985, using anchor points. As implemented for this report, the scale anchoring process provides a concise summary of what students know and can do at various points along the scale that differentiates them from students performing at lower levels. First, students performing at or around four intervals on the scale were identified (200, 250, 300, and 350 -- each of which is one standard deviation unit apart). Next, questions were identified that were answered correctly by 65 percent or more of the students at one level and by fewer than half of the students at the next lower level. Finally, mathematics educators were asked to analyze each anchor-level question and create summary descriptions of the knowledge and skills evidenced by students who answered these sets of questions successfully. The critical distinction here is that anchor levels attempt to describe what students *can* do at and around selected points on the NAEP scale; achievement levels attempt to describe what students *should be able to do* in various ranges of the NAEP scale.

Future Work

These achievement level standards are in the second round (the first being in 1990) in a developmental process which has been revised and is still under review through several studies.[2] The Board's goal is to provide a statement of what American students *should* be able to do as a standard that can give more meaning to the NAEP data. They then want to use the NAEP data to inform the nation as to how many students actually *can* meet these standards.

NCES realizes that modifications and improvements may be necessary in the future as current procedures are evaluated and new approaches are considered. NCES conceives of this process as a research and developmental activity in which numerous statistical, psychometric, and substantive issues must be resolved. At the present time the effort is hampered by the problem of trying to create standards on a given framework and item pool developed for another purpose. In the future the measurement of standards will be a more prominent influence on the development of NAEP procedures.

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[2] *Assessing Student Achievement in the States.* The First Report of the National Academy of Education Panel on the Evaluation of the NAEP Trial State Assessment: 1990 Trial State Assessment. (Stanford, CA: National Academy of Education, 1992).; R.L. Linn, D.M. Koretz, E.L. Baker, and L. Burstein. *The Validity and Credibility of the Achievement Levels for the 1990 National Assessment of Educational Progress in Mathematics*, Technical Report CSE No. 330. (Los Angeles, CA: Center for Research on Evaluation, Standards, and Student Testing, UCLA, June, 1991).

The goal of the National Center for Education Statistics is to make data available for the public and to do so in accurate and understandable ways that are not misleading. In this case, much of what matters in NAEP is changing:

- the *content* in response to the developing standards of various curricular groups;
- the *test items* in response to new developments in assessments; and
- the *reporting* in response to, and increasing interest in, student achievement relative to standards of student performance.

We believe that the numerous completed and ongoing studies will lead to national debate that will assure the public is well informed about these issues -- as informed they must be because the results will be a vital influence on what Americans come to think about the condition and progress of our schools.

In addition, the public needs the data in this report to see for themselves what standards-based reporting might do and to evaluate the often conflicting claims of adherents and detractors of these changes in approaches to reporting on the educational achievement of American students. The Center eventually wants to use the achievement levels to describe what students know and can do. In order to accomplish that, the frameworks, tests, and achievement levels may need to be developed in tandem. That is easier to say than to do, however, because it implies a substantially larger pool of test exercises, carefully designed to support reporting about performance relative to a set of performance standards. Clearly this is a developmental effort that will take time and several iterations, during which data supporting appropriate inferences about the performance of American students will continue to be gathered.

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EXECUTIVE SUMMARY

In 1988, Congress passed new legislation for the National Assessment of Educational Progress (NAEP) that continued its primary mission of providing dependable and comprehensive information about educational progress in the United States. In addition, for the first time in the project's history, the legislation also included a provision authorizing voluntary, state-by-state assessments on a trial basis.

As a result of the legislation, the 1990 NAEP program included a Trial State Assessment Program that assessed public-school students in 37 states, the District of Columbia, and two territories in eighth-grade mathematics.[3] The 1992 NAEP program included an expanded Trial State Assessment Program in fourth- and eighth-grade mathematics and fourth-grade reading, with public-school students assessed in 41 states, the District of Columbia, and two territories. In addition, national assessments in mathematics, reading, writing, and science were conducted concurrently with the Trial State Assessment Program in 1990 and in 1992.

In Pennsylvania in 1992, 111 public schools participated in the fourth-grade mathematics assessment, and 99 participated in the eighth-grade mathematics assessment. The weighted **school** participation rate was 95 percent in fourth grade and 94 percent in eighth grade, which means that the fourth-grade students in this sample of schools were representative of 95 percent of **all** the fourth-grade public-school students in Pennsylvania, and the eighth-grade students in this sample of schools were representative of 94 percent of **all** the eighth-grade public-school students in Pennsylvania.

In total, 2,740 fourth-grade and 2,640 eighth-grade Pennsylvania public-school students were assessed in mathematics. The weighted **student** participation rate was 96 percent in grade 4 and 94 percent in grade 8. This means that the sample of students who took part in the assessment was representative of 96 percent and 94 percent of the **eligible** fourth-grade and eighth-grade public-school student populations in participating schools in Pennsylvania (that is, all students minus those excluded from the assessment). The **overall** weighted response rate (school rate times student rate) was 91 percent in fourth grade and 89 percent in eighth grade. This means that the sample of students who participated in the assessment was representative of 91 percent and 89 percent of the eligible fourth- and eighth-grade public-school student populations in Pennsylvania, respectively.

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[3] For a summary of the 1990 program, see Ina V.S. Mullis, John A. Dossey, Eugene H. Owen, and Gary W. Phillips. *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States.* (Washington, DC: National Center for Education Statistics, 1991).

Students' Mathematics Performance

Students' performance in mathematics was summarized on the NAEP mathematics scale, which ranges from 0 to 500.

Grade 4 1992 The average proficiency of public-school students from Pennsylvania on the NAEP mathematics scale was 223. This proficiency was higher than that of students across the nation (217).[4] The lowest performing 10 percent of the students from Pennsylvania had proficiencies below 181 while the top 10 percent of the students had proficiencies above 262.

Grade 8 1992 The average proficiency of public-school students from Pennsylvania on the NAEP mathematics scale was 271. This proficiency was higher than that of students across the nation (266). The lowest performing 10 percent of the students in Pennsylvania had proficiencies below 225 while the top 10 percent of the students had proficiencies above 314.

Grade 8 1990 vs 1992 The average proficiency of public-school students in Pennsylvania in 1992 was about the same as the average proficiency in 1990 (271 in 1992 and 266 in 1990). In Pennsylvania, the score that signified the 10th percentile in 1992 (225) was about the same as the score that signified the 10th percentile in 1990 (222). Similarly, the score that signified the 90th percentile in 1992 (314) was about the same as the score that signified the 90th percentile in 1990 (309).

LEVELS OF ACHIEVEMENT

When Congress established the National Assessment Governing Board (NAGB) in 1988 to set policy for NAEP, it charged the board with "identifying appropriate achievement goals for each age and grade in each subject area to be tested under the National Assessment." (Pub. L. 297-100 Section 3403 (a)(5)(B)(ii)).

NAGB developed three achievement levels for each grade -- Basic, Proficient, and Advanced. Performance at the Basic level denotes partial mastery of the knowledge and skills that are fundamental for proficient work at each grade level. The central level, called Proficient, represents solid academic performance at each grade level tested. Students reaching this level demonstrate competency over challenging subject matter and are well prepared for the next level of schooling. Achievement at the Advanced level signifies superior performance at the grade tested.

Grade 4 1992 More than half of the students in public schools in Pennsylvania (66 percent), versus 59 percent in the nation, are at or above the Basic level. About one quarter of the students in Pennsylvania (23 percent), versus 18 percent in the nation, are at or above the Proficient level. Relatively few of the students in Pennsylvania (3 percent), versus 2 percent in the nation, are at or above the Advanced level.

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[4] Differences reported are statistically significant at the 95 percent confidence level. This means that with 95 percent confidence, there is a real difference in the average mathematics proficiency between the two populations of interest. "About the same" means that no statistically significant difference was found at the 95 percent confidence level.

Grade 8 1992

More than half of the public-school students in Pennsylvania (67 percent), versus 61 percent in the nation, are at or above the Basic level, while about one quarter of the students in Pennsylvania (26 percent), versus 23 percent in the nation, are at or above the Proficient level, and relatively few of the students in Pennsylvania (3 percent), versus 3 percent in the nation, are at or above the Advanced level.

Grade 8 1990 vs 1992

Compared to 1990, there was no significant difference in the percentage of students in Pennsylvania at or above the Basic level (67 percent in 1992 compared to 63 percent in 1990), no significant difference in the percentage of students at or above the Proficient level (26 percent in 1992 compared to 21 percent in 1990), and no significant difference in the percentage of students at or above the Advanced level (3 percent in 1992 compared to 2 percent in 1990).

CONTENT AREA PERFORMANCE

The questions comprising the Trial State Assessment covered the content areas of Numbers and Operations; Measurement; Geometry; Data Analysis, Statistics, and Probability; and Algebra and Functions; as well as Estimation skills. Estimation was measured using a special paced audiotape that limited the amount of time students had to work on each question and made any direct calculations of answers difficult. The information from the Estimation section is intended to supplement the data obtained from the Numbers and Operations and the Measurement questions administered using the more traditional paper-and-pencil or calculator approaches.

Grade 4 1992

Students in Pennsylvania performed higher than students in the nation in Numbers and Operations, Measurement, Data Analysis, Statistics, and Probability, and Algebra and Functions.

Grade 8 1992

Students in Pennsylvania performed higher than students in the nation in Measurement.

Grade 8 1990 vs 1992

Estimation was not included in the 1990 Trial State Assessment program. Therefore, change in eighth-grade performance is provided only for the five content areas. The performance of public-school students in Pennsylvania stayed about the same from 1990 to 1992 in all of the five content areas.

Subpopulation Performance

Many of the reforms recommended for mathematics education have emphasized the need to stress mathematics for all students.[5] Nevertheless, assessment results consistently show lower achievement for subpopulations of students who are less advantaged than their classmates.[6] The 1992 Trial State Assessment sheds further light on this by reporting on the performance of various subgroups of the student population defined by race/ethnicity, type of community, parents' education level, and gender.

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[5] *Everybody Counts: A Report to the Nation on the Future of Mathematics Education*, Lynn Steen, Ed. (Washington, DC: National Research Council, National Academy Press, 1989).

[6] Ina V.S. Mullis, John A. Dossey, Eugene H. Owen, and Gary W. Phillips. *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States.* (Washington, DC: National Center for Education Statistics, 1991).

In Pennsylvania:

RACE/ETHNICITY

Grade 4 1992 White students demonstrated higher average mathematics proficiency than did Black or Hispanic students. About one quarter of the White students (27 percent), relatively few of the Black students (2 percent), and relatively few of the Hispanic students (8 percent) were at or above the Proficient level.

Grade 8 1992 White students demonstrated higher average mathematics proficiency than did Black or Hispanic students. About one quarter of the White students (29 percent), relatively few of the Black students (6 percent), and relatively few of the Hispanic students (8 percent) were at or above the Proficient level.

Grade 8 1990 vs 1992 The performance of White and Hispanic students was higher in 1992 than it was in 1990. The performance of Black students stayed about the same from 1990 to 1992. About the same percentage of White, Black, and Hispanic students were at or above the Proficient level in 1992 as in 1990.

TYPE OF COMMUNITY

Grade 4 1992 Students attending schools in advantaged urban areas demonstrated higher average mathematics proficiency than did students attending schools in disadvantaged urban areas and about the same mathematics proficiency as did students attending schools in extreme rural areas or areas classified as "other". Less than half of the students attending schools in advantaged urban areas (38 percent), relatively few of the students in disadvantaged urban areas (5 percent), about one quarter of the students in extreme rural areas (26 percent), and about one quarter of the students in areas classified as "other" (23 percent) were at or above the Proficient level.

Grade 8 1992 Students attending schools in advantaged urban areas demonstrated higher average mathematics proficiency than did students attending schools in disadvantaged urban areas or areas classified as "other" and about the same mathematics proficiency as did students attending schools in extreme rural areas. About half of the students attending schools in advantaged urban areas (47 percent), relatively few of the students in disadvantaged urban areas (9 percent), about one quarter of the students in extreme rural areas (29 percent), and about one quarter of the students in areas classified as "other" (29 percent) were at or above the Proficient level.

Grade 8 1990 vs 1992 The performance of students in areas classified as "other" was higher in 1992 than it was in 1990. Students in advantaged urban areas, disadvantaged urban areas, and extreme rural areas performed about the same in 1992 as in 1990. A greater percentage of students in areas classified as "other" were at or above the Proficient level in 1992 than in 1990. About the same percentage of students in advantaged urban areas, disadvantaged urban areas, and extreme rural areas were at or above the Proficient level in 1992 as in 1990.

PARENTS' EDUCATION LEVEL

Grade 4
1992

Students who reported that at least one parent graduated from college demonstrated about the same average mathematics proficiency as did students who reported that at least one parent had some education after high school but higher mathematics proficiency than did students who reported that at least one parent graduated from high school, neither parent graduated from high school, or they did not know their parents' education level. Achievement was at or above the Proficient level for 30 percent of the students who reported that at least one parent graduated from college, 38 percent of the students who reported that at least one parent had some education after high school, 17 percent of the students who reported that at least one parent graduated from high school, 8 percent of the students who reported that neither parent graduated from high school, and 14 percent of the students who reported that they did not know their parents' education level.

Grade 8
1992

Students who reported that at least one parent graduated from college demonstrated higher mathematics proficiency than did students who reported that at least one parent had some education after high school, at least one parent graduated from high school, neither parent graduated from high school, or they did not know their parents' education level. Achievement was at or above the Proficient level for 39 percent of the students who reported that at least one parent graduated from college, 25 percent of the students who reported that at least one parent had some education after high school, 16 percent of the students who reported that at least one parent graduated from high school, 9 percent of the students who reported that neither parent graduated from high school, and 10 percent of the students who reported that they did not know their parents' education level.

Grade 8
1990 vs 1992

Students who reported that at least one parent graduated from college, at least one parent had some education after high school, at least one parent graduated from high school, neither parent graduated from high school, or they did not know their parents' education level performed about the same in 1992 as in 1990. About the same percentage of students who reported that at least one parent graduated from college, at least one parent had some education after high school, at least one parent graduated from high school, neither parent graduated from high school, or they did not know their parents' education level were at or above the Proficient level in 1992 as in 1990.

GENDER

Grades 4 & 8
1992

In Pennsylvania, there appears to be no significant difference in the average proficiency of fourth-grade males and females; however, in grade 8, females had a lower average proficiency than did males. There was no significant difference between the percentages of fourth-grade males and females who were at or above the Proficient level (21 percent for females and 24 percent for males). In addition, there was a difference between the percentages of eighth-grade males and females who were at or above the Proficient level (23 percent for females and 29 percent for males).

Grade 8
1990 vs 1992

The average mathematics proficiency for eighth-grade females in 1992 was about the same as the average mathematics proficiency for eighth-grade females in 1990. The average mathematics proficiency for eighth-grade males in 1992 was about the same as the average mathematics proficiency for eighth-grade males in 1990. Furthermore, about the same percentage of eighth-grade males were at or above the Proficient level in 1992 as in 1990. About the same percentage of eighth-grade females were at or above the Proficient level in 1992 as in 1990.

A Context for Understanding Students' Mathematics Proficiency

The results of the Trial State Assessment can be used to monitor students' progress in achieving the recommendations of the National Council of Teachers of Mathematics and to examine both school and home contexts for educational support. The public-school students participating in the 1992 Trial State Assessment, their mathematics teachers, and the principals or other administrators in their schools were asked to complete questionnaires on policies, instruction, and programs. These student, teacher, and school data help to describe some of the current practices and emphases in mathematics education, illuminate some of the factors that appear to be related to fourth- and or eighth-grade public-school students' proficiency in the subject, and provide an educational context for understanding data on student achievement. The data from the questionnaires also provide a means to examine changes in policies, instruction, and programs at the eighth-grade level between 1990 and 1992 for those states and territories that participated in both Trial State Assessment Programs.

Highlights of the results for the public-school students in Pennsylvania are as follows:

CURRICULUM COVERAGE AND INSTRUCTIONAL EMPHASIS

- According to their mathematics teachers, 67 percent of the fourth-grade students and 24 percent of the eighth-grade students received four or more hours of mathematics instruction per week.
- According to their mathematics' teachers, the greatest percentage of fourth-grade students were assigned either 15 or 30 minutes of mathematics homework each day, and the greatest percentage of eighth-grade students were assigned 30 minutes of mathematics homework each day.
- According to the students in grade 8, average mathematics proficiency was higher for students in Pennsylvania who spent 45 minutes on mathematics homework than for students who spent no time on mathematics homework each day.
- In Pennsylvania, 95 percent of the fourth-grade students had mathematics teachers who placed heavy instructional emphasis on Numbers and Operations, 13 percent had teachers who placed heavy instructional emphasis on Measurement, 4 percent had teachers who placed heavy instructional emphasis on Geometry, 4 percent had teachers who placed heavy instructional emphasis on Data Analysis, Statistics, and Probability, and 2 percent had teachers who placed heavy instructional emphasis on Algebra and Functions.
- In Pennsylvania, 72 percent of the eighth-grade students had mathematics teachers who placed heavy instructional emphasis on Numbers and Operations, 11 percent had teachers who placed heavy instructional emphasis on Measurement, 18 percent had teachers who placed heavy instructional emphasis on Geometry, 10 percent had teachers who placed heavy instructional emphasis on Data Analysis, Statistics, and Probability, and 48 percent had teachers who placed heavy instructional emphasis on Algebra and Functions.

DELIVERY OF MATHEMATICS INSTRUCTION

- According to the mathematics teachers in Pennsylvania, 59 percent of the fourth-grade students and 41 percent of the eighth-grade students worked mathematics problems in small groups at least weekly; some in grade 4 and about one quarter in grade 8 never or hardly ever worked mathematics problems in small groups (12 percent and 21 percent, respectively).

- According to the students in Pennsylvania, 38 percent of the fourth-grade students and 32 percent of the eighth-grade students worked mathematics problems in small groups at least weekly; 43 percent in grade 4 and 41 percent in grade 8 reported never or hardly ever working mathematics problems in small groups.

- According to the mathematics teachers in Pennsylvania, 83 percent of the fourth-grade students and 86 percent of the eighth-grade students were assigned problems from a mathematics textbook almost every day; 2 percent and 2 percent in fourth and eighth grade, respectively, worked textbook problems less than weekly.

- According to the students in Pennsylvania, 71 percent of the fourth-grade students and 85 percent of the eighth-grade students were assigned problems from a mathematics textbook almost every day; 12 percent and 5 percent in fourth and eighth grade, respectively, worked textbook problems less than weekly.

USE OF CALCULATORS

- In Pennsylvania, 64 percent of eighth-grade students were in schools in which they were given access to four-function calculators and 31 percent were in schools in which they were given access to scientific calculators. Across the nation, these figures were 66 percent for four-function calculators and 37 percent for scientific calculators. In addition, in Pennsylvania, 58 percent of eighth graders had mathematics teachers who reported providing instruction to students about the use of four-function calculators and 26 percent had teachers who reported providing instruction about scientific calculators. Nationally, these figures were 64 percent and 37 percent of the eighth-grade students, respectively.

- According to the students' mathematics teachers, 18 percent of the fourth-grade students and 46 percent of the eighth-grade students used calculators at least once a week in mathematics class. By comparison, 48 percent and 30 percent in fourth and eighth grade, respectively, never or hardly ever used a calculator. In 1990, 28 percent of the eighth-grade students had mathematics teachers who reported that they used calculators at least once a week and 36 percent had mathematics teachers who reported that they never or hardly ever used calculators.

EDUCATIONAL BACKGROUND OF TEACHERS

- In Pennsylvania, 57 percent of the fourth-grade students and 50 percent of the eighth-grade students were being taught by mathematics teachers who reported having at least a master's or education specialist's degree. Across the nation, these figures were 47 percent and 47 percent for fourth- and eighth-grade students, respectively.

- In Pennsylvania, 5 percent of the fourth-grade and 57 percent of the eighth-grade public-school students were being taught mathematics by teachers who had an undergraduate major in mathematics. Across the nation, 5 percent of the fourth-grade students and 45 percent of the eighth-grade students had mathematics teachers with a major in mathematics.

HOME FACTORS

- Grade 4 students in Pennsylvania who had all four types of reading materials (an encyclopedia, newspapers, magazines, and more than 25 books in the home) showed a higher mathematics proficiency than did students with zero to two types of materials. This is similar to the results for the grade 8 students in Pennsylvania, where students who had all four types of materials showed a higher mathematics proficiency than did students who had zero to two types.
- Some of the fourth-grade public-school students in Pennsylvania (19 percent) watched one hour or less of television each day; 18 percent watched six hours or more.
- Some of the eighth-grade public-school students in Pennsylvania (16 percent) watched one hour or less of television each day; 9 percent watched six hours or more. In 1990, 14 percent watched one hour or less of television each day while 10 percent watched six hours or more.

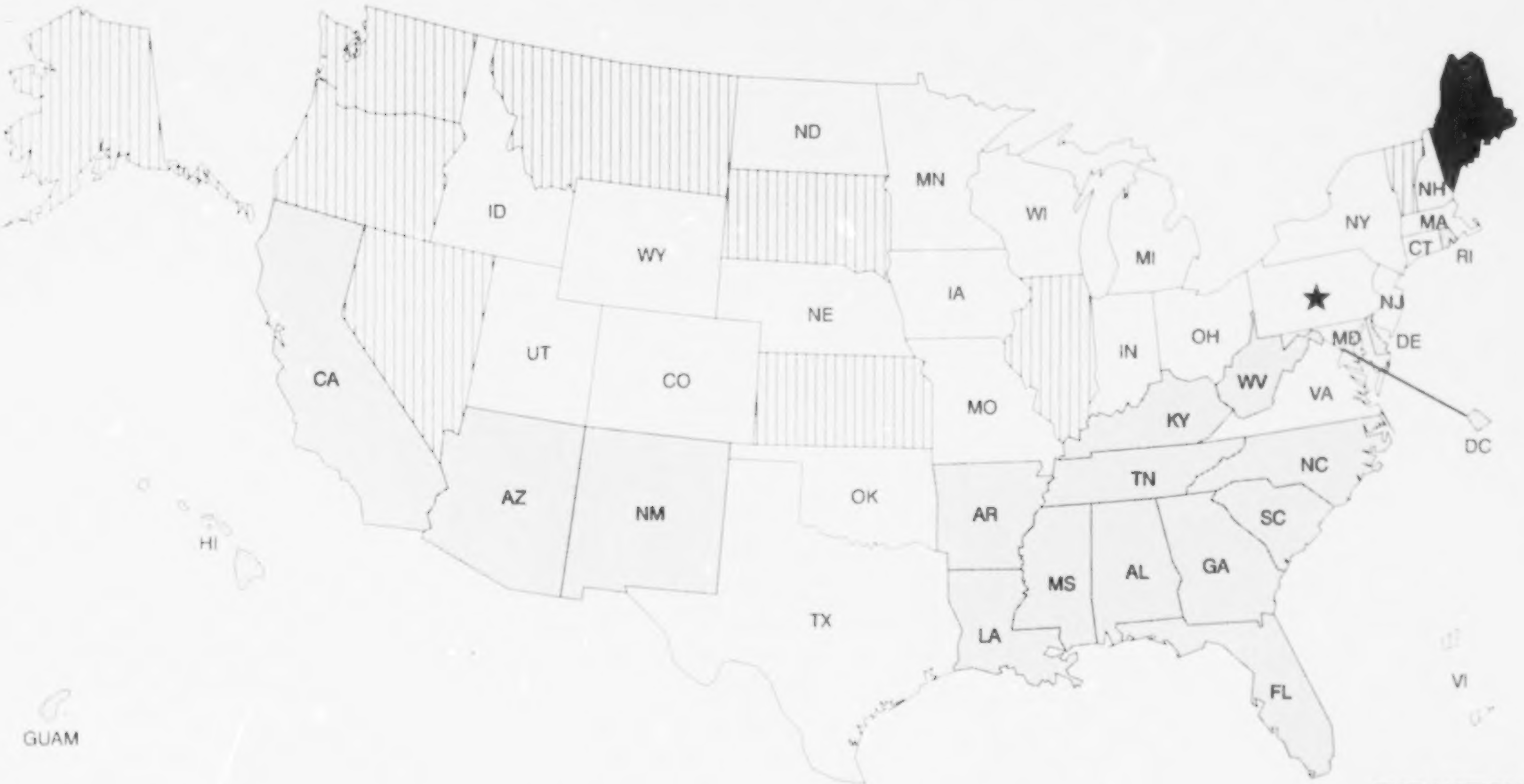
Comparisons of Overall Mathematics Proficiency in Pennsylvania with Other States

The maps on the following pages provide a method for making appropriate comparisons of the average overall mathematics proficiency in Pennsylvania with that in the other states (including the District of Columbia) and territories that participated in the NAEP 1992 Trial State Assessment Program. The different shadings of the states on the map show whether the average overall proficiency in the other states was statistically different from or not statistically different from that in Pennsylvania ("Target State"). States with a dark-colored shading have a significantly higher average proficiency than does Pennsylvania. States with a light-colored shading have a significantly lower average proficiency than does Pennsylvania. States without shading are not significantly different from Pennsylvania. The significance tests are based on a Bonferroni procedure for multiple comparisons that holds the probability of erroneously declaring the means of any two states to be different, when they are not, to five percent across all possible comparisons. Separate maps are provided for the results for grade 4 and grade 8.

The 1992 Trial State Assessment

Comparisons of Overall Mathematics Proficiency at Grade 4

Pennsylvania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★ Target state
■ State has statistically significantly higher average proficiency than target state
☐ No statistically significant difference from target state
▨ State has statistically significantly lower average proficiency than target state
▥ State did not participate

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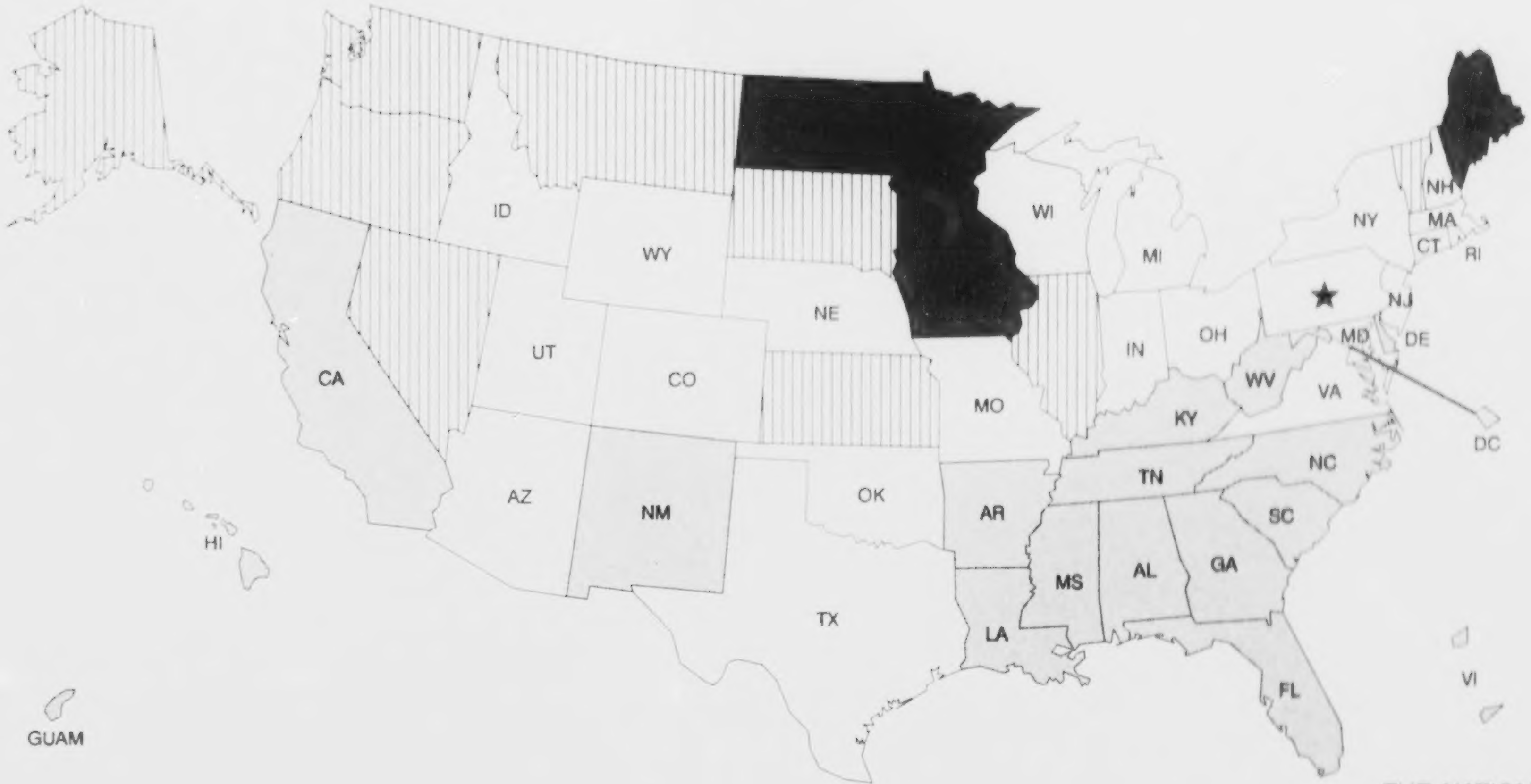
Comparisons of Overall Mathematics Proficiency at Grade 8

Pennsylvania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★ Target state
■ State has statistically significantly higher average proficiency than target state
☐ No statistically significant difference from target state
▒ State has statistically significantly lower average proficiency than target state
▥ State did not participate

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OVERVIEW

In 1988, Congress passed new legislation for the National Assessment of Educational Progress (NAEP) that continued its primary mission of providing dependable and comprehensive information about educational progress in the United States. In addition, for the first time in the project's history, the legislation also included a provision authorizing voluntary, state-by-state assessments on a trial basis:

> *The National Assessment shall develop a trial mathematics assessment survey instrument for the eighth grade and shall conduct a demonstration of the instrument in 1990 in States which wish to participate, with the purpose of determining whether such an assessment yields valid, reliable State representative data. (Section 406(i)(2)(C)(i) of the General Education Provisions Act, as amended by Pub. L. 100-297 (U.S.C. 1221e-1(i)(2)(c)(i)))*
>
> *The National Assessment shall conduct a trial mathematics assessment for the fourth and eighth grades in 1992 and, pursuant to subparagraph (6)(D), shall develop a trial reading assessment to be administered in 1992 for the fourth grade in States which wish to participate, with the purpose of determining whether such an assessment yields valid, reliable State representative data. (Section 406(i)(2)(C)(i) of the General Education Provisions Act, as amended by Pub. L. 100-297 (U.S.C. 1221e-1(i)(2)(c)(ii)))*

As a result of the legislation, the 1990 NAEP program included a Trial State Assessment Program that assessed public-school students in 37 states, the District of Columbia, and two territories in eighth-grade mathematics.[7] The 1992 NAEP program included an expanded Trial State Assessment Program in fourth- and eighth-grade mathematics and fourth-grade reading, with public-school students assessed in 41 states, the District of Columbia, and two territories. In addition, national assessments in mathematics, reading, writing, and science were conducted concurrently with the Trial State Assessment Program in 1990 and in 1992.

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[7] For a summary of the 1990 program, see Ina V.S. Mullis, John A. Dossey, Eugene H. Owen, and Gary W. Phillips. *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States.* (Washington, DC: National Center for Education Statistics, 1991).

The 1992 Trial State Assessment Program was conducted in February 1992 with the following 44 participants:

Alabama
Arizona
Arkansas
California
Colorado
Connecticut
Delaware
District of Columbia
Florida
Georgia
Hawaii
Idaho
Indiana
Iowa
Kentucky
Louisiana
Maine
Maryland
Massachusetts
Michigan
Minnesota
Mississippi
Missouri
Nebraska
New Hampshire
New Jersey
New Mexico
New York
North Carolina
North Dakota
Ohio
Oklahoma
Pennsylvania
Rhode Island
South Carolina
Tennessee
Texas
Utah
Virginia
West Virginia
Wisconsin
Wyoming

Guam
Virgin Islands*

* The Virgin Islands participated in the testing portion of the 1992 Trial State Assessment Program. However, in accordance with the legislation providing for participants to review and give permission for release of their results, the Virgin Islands chose not to release their results at grade 4 in the reports.

States in bold type did not participate in the 1990 Trial State Assessment. Three states -- Montana, Illinois, and Oregon -- participated in the 1990 Trial State Assessment but not in the 1992 program.

For the 1992 Trial State Assessment, approximately 2,500 students were assessed in each jurisdiction for each grade and subject area. The samples were carefully designed to represent the fourth- and eighth-grade public-school populations in each state or territory. Similar to the 1990 program, local school district personnel administered all assessment sessions, and the contractor's staff monitored 50 percent of the sessions as part of the quality assurance program designed to ensure that the sessions were conducted uniformly. The results of the monitoring in 1990 and 1992 indicated a high degree of quality and uniformity across sessions.

Both the 1990 and 1992 Trial State Assessments in mathematics were based on a set of objectives developed for the program and patterned after the consensus process described in Public Law 98-511, Section 405 (E), which authorized NAEP through June 30, 1988. Anticipating the 1988 legislation that authorized the Trial State Assessment, the National Science Foundation and the U.S. Department of Education issued a special grant to the Council of Chief State School Officers in mid-1987 to develop the objectives. The objectives development process included careful attention to the standards developed by the National Council of Teachers of Mathematics,[8] the formal mathematics objectives of states and of a sampling of local districts, and the opinions of practitioners at the state and local levels as to what content should be assessed.

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[8] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989).

The objectives were reviewed extensively by mathematics educators, scholars, states' mathematics supervisors, the National Center for Education Statistics (NCES), and the Assessment Policy Committee (APC), a panel advising on NAEP policy at that time. They were further refined by NAEP's Item Development Panel, reviewed by the Task Force on State Comparisons, and resubmitted to NCES for peer review. Because the objectives needed to be coordinated across all grades for the national program, the final objectives provided specifications for the NAEP mathematics assessment at the fourth, eighth, and twelfth grades, rather than solely for the Trial State Assessment Program. An overview of the mathematics objectives is provided in the Procedural Appendix.

This Report

This is a computer-generated report that describes the mathematics performance of fourth- and eighth-grade public-school students in Pennsylvania, in the Northeast region, and across the nation. A separate report will describe the results of the fourth-grade reading assessment. This report consists of three sections:

- The Overview provides background information about the Trial State Assessment and a profile of the fourth- and eighth-grade public-school students in Pennsylvania.
- Part One describes the mathematics performance of the fourth- and eighth-grade public-school students in Pennsylvania, the Northeast region, and the nation. It also describes the change in eighth-grade performance for those jurisdictions that participated in both the 1990 and 1992 Trial State Assessment Programs.
- Part Two relates fourth- and eighth-grade students' mathematics performance to contextual information about the mathematics policies and instruction in Pennsylvania, the Northeast region, and the nation. Part Two also compares the eighth-grade data for 1990 and 1992 for those jurisdictions that participated in both Trial State Assessment Programs.

In this report, results are provided for groups of students defined by shared characteristics -- race/ethnicity, type of community, parents' education level, and gender. Definitions of these subpopulations are presented below. The results for Pennsylvania are based on the representative sample of students who participated in the 1992 Trial State Assessment Program. The results for the nation and the region of the country are based on the nationally and regionally representative samples of public-school students who were assessed in January through March as part of the 1992 national NAEP program. Using the regional and national results from the 1992 national NAEP program is necessary because the voluntary nature of the Trial State Assessment Program did not guarantee representative national or regional results from the aggregated data across states, since not every state participated in the program. Specific details on the samples and analysis procedures used in 1990 and 1992 can be found in the Technical Reports for the NAEP Trial State Assessment Program for each of the assessment years.[9]

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[9] *Technical Report of NAEP's 1990 Trial State Assessment Program.* (Washington, DC: National Center for Education Statistics, 1991).; *Technical Report of the NAEP 1992 Trial State Assessment in Mathematics.* (Washington, DC: National Center for Education Statistics, 1993).

RACE/ETHNICITY

Results are presented for students of different racial/ethnic groups based on the students' self-identification of their race/ethnicity according to the following mutually exclusive categories: White, Black, Hispanic, Asian (including Pacific Islander), and American Indian (including Alaskan Native). Based on criteria described in the Procedural Appendix, there must be at least 62 students in a particular subpopulation in order for the results for that subpopulation to be considered reliable. Thus, results for racial/ethnic groups with fewer than 62 students are not reported. However, the data for all students, regardless of whether their racial/ethnic group was reported separately, were included in computing overall results for Pennsylvania. In addition, change in eighth-grade performance from 1990 to 1992 is reported only for those racial/ethnic groups for which there were at least 62 students in both the 1990 and 1992 samples.

TYPE OF COMMUNITY

Results are provided for four mutually exclusive community types -- advantaged urban, disadvantaged urban, extreme rural, and other -- as defined below:

> *Advantaged Urban:* Students in this group live in metropolitan statistical areas and attend schools where a high proportion of the students' parents are in professional or managerial positions.
>
> *Disadvantaged Urban:* Students in this group live in metropolitan statistical areas and attend schools where a high proportion of the students' parents are on welfare or are not regularly employed.
>
> *Extreme Rural:* Students in this group live outside metropolitan statistical areas, live in areas with a population below 10,000, and attend schools where many of the students' parents are farmers or farm workers.
>
> *Other:* Students in this category attend schools in areas other than those defined as advantaged urban, disadvantaged urban, or extreme rural.

The reporting of results by each type of community was also subject to a minimum student sample size of 62. Change in eighth-grade performance is reported only for those types of communities for which there were at least 62 students in both the 1990 and 1992 samples.

PARENTS' EDUCATION LEVEL

Students were asked to indicate the extent of schooling for each of their parents -- did not finish high school, graduated from high school, some education after high school, or graduated from college. The response indicating the higher level of education was selected for reporting. Reporting of results by parents' education level was also subject to a minimum student sample size of 62, and change in eighth-grade performance is reported only for those levels of parents' education for which there were at least 62 students in both the 1990 and 1992 samples.

GENDER

Results are reported separately for males and females.

REGION

The United States has been divided into four regions: Northeast, Southeast, Central, and West. States included in each region are shown in Figure 1. All 50 states and the District of Columbia are listed, with the participants in the Trial State Assessment highlighted in boldface type. Territories were not assigned to a region. Further, the part of Virginia that is included in the Washington, DC, metropolitan statistical area is included in the Northeast region; the remainder of the state is included in the Southeast region. Because most of the students are in the Southeast region, regional comparisons for Virginia are to the Southeast.

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FIGURE 1 | **Regions of the Country**

NORTHEAST	SOUTHEAST	CENTRAL	WEST
Connecticut	**Alabama**	Illinois	Alaska
Delaware	**Arkansas**	**Indiana**	**Arizona**
District of Columbia	**Florida**	**Iowa**	**California**
Maine	**Georgia**	Kansas	**Colorado**
Maryland	**Kentucky**	**Michigan**	**Hawaii**
Massachusetts	**Louisiana**	**Minnesota**	**Idaho**
New Hampshire	**Mississippi**	**Missouri**	Montana
New Jersey	**North Carolina**	**Nebraska**	Nevada
New York	**South Carolina**	**North Dakota**	**New Mexico**
Pennsylvania	**Tennessee**	**Ohio**	**Oklahoma**
Rhode Island	**Virginia**	South Dakota	Oregon
Vermont	**West Virginia**	**Wisconsin**	**Texas**
Virginia			**Utah**
			Washington
			Wyoming

Guidelines for Analysis and Reporting

This report describes the mathematics proficiency of fourth- and eighth-grade students attending public schools and compares the results for various groups of students within that population -- for example, those who have certain demographic characteristics or who responded to a specific background question in a particular way. The report examines the results for individual groups and individual background questions. It does not include an analysis of the relationships among combinations of these subpopulations or background questions.

Because the proportions of students in these groups and their average proficiency are based on samples -- rather than the entire population of fourth or eighth graders in public schools in the state or territory -- the numbers reported are necessarily *estimates*. As such, they are subject to a measure of uncertainty, reflected in the *standard error* of the estimate. When the proportions or average proficiency of certain groups are compared, it is essential that the standard error be taken into account, rather than relying solely on observed similarities or differences. Therefore, the comparisons discussed in this report are based on *statistical tests* that consider both the magnitude of the difference between the means or proportions and the standard errors of those statistics.

The statistical tests determine whether the evidence -- based on the data from the groups in the *sample* -- is strong enough to conclude that the means or proportions are really different for those groups in the *population*. If the evidence is strong (i.e., the difference is *statistically significant*), the report describes the group means or proportions as being different (e.g., one group performed *higher than* or *lower than* another group) -- regardless of whether the sample means or sample proportions appear to be about the same or not. If the evidence is not sufficiently strong (i.e., the difference is not statistically significant), the means or proportions are described as being *about the same* -- again, regardless of whether the sample means or sample proportions appear to be about the same or widely discrepant. The reader is cautioned to rely on the results of the statistical tests -- rather than on the apparent magnitude of the difference between sample means or proportions -- to determine whether those sample differences are likely to represent actual differences between the groups in the population. The statistical tests and Bonferroni procedure, which is used when more than two groups are being compared, are discussed in greater detail in the Procedural Appendix.

In addition, some of the percentages reported in the text of the report are given quantitative descriptions. The descriptive phrases used and the rules used to select them are also described in the Procedural Appendix.

Finally, in several places in this report, results (mean proficiencies and proportions) are reported in the text for combined groups of students. For example, in the text, the percentage of students in the combined group taking either algebra or pre-algebra is given and compared to the percentage of students enrolled in eighth-grade mathematics. However, the tables that accompany that text report percentages and proficiencies separately for the three groups (algebra, pre-algebra, and eighth-grade mathematics). The combined-group percentages reported in the text and used in all statistical tests are based on *unrounded* estimates (i.e., estimates calculated to several decimal places) of the percentages in each group. The percentages shown in the tables are *rounded* to integers. Thus, percentages may not always add up to 100 percent due to rounding. Also, the percentage for a combined group (reported in the text) may differ slightly from the sum of the separate percentages (presented in the tables) for each of the groups that were combined. Therefore, if statistical tests were to be conducted based on the rounded numbers in the tables, the results might not be consonant with the results of the statistical tests that are reported in the text (based on unrounded numbers).

Profile of Pennsylvania

FOURTH- AND EIGHTH-GRADE SCHOOL AND STUDENT CHARACTERISTICS

Table 1 provides a profile of the demographic characteristics of the fourth- and eighth-grade public-school students in Pennsylvania, the Northeast region, and the nation. The profile is based on data collected from the students and schools participating in the 1992 NAEP mathematics assessments.

SCHOOLS AND STUDENTS ASSESSED

Table 2 summarizes participation data for Pennsylvania schools and students sampled for both the 1990 and 1992 Trial State Assessment in mathematics.[10] In Pennsylvania, in 1992, 111 public schools participated in the fourth-grade assessment, and 99 participated in the eighth-grade assessment. These numbers include participating substitute schools that were selected for some of the nonparticipating schools from the original sample. The weighted **school** participation rate was 95 percent in fourth grade and 94 percent in eighth grade, which means that the fourth-grade students in this sample of schools were representative of 95 percent of **all** the fourth-grade public-school students in Pennsylvania, and the eighth-grade students in this sample of schools were representative of 94 percent of **all** the eighth-grade public-school students in Pennsylvania.

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[10] For a detailed discussion of the NCES guidelines for sample participation, see *School and Student Participation Rates for the Mathematics Assessment* (Washington, DC: National Center for Education Statistics, 1992).; or see Appendix B of the 1992 State Technical Report.

In each school, a random sample of students was selected to participate in the assessment. As estimated by the sample, 1 percent of the fourth-grade and 1 percent of the eighth-grade public-school populations were classified as Limited English Proficient (LEP), while 8 percent in fourth grade and 9 percent in eighth grade had an Individualized Education Plan (IEP). An IEP is a plan, written for a student who has been determined to be eligible for special education, that typically sets forth goals and objectives for the student and describes a program of activities and/or related services necessary to achieve the goals and objectives. Handicapped or disabled students may be categorized as IEP.

Schools were permitted to exclude certain students from the assessment. To be excluded, a student had to be categorized as Limited English Proficient or had to have an Individualized Education Plan *and* (in either case) be judged incapable of participating in the assessment. The intent was to assess all selected students; therefore, all selected students who were capable of participating in the assessment should have been assessed. However, schools were allowed to exclude those students who, in the judgment of school staff, could not meaningfully participate. The NAEP guidelines for exclusion are intended to assure uniformity of exclusion criteria from school to school. Note that some LEP and IEP students were deemed eligible to participate and not excluded from the assessment. The students in Pennsylvania who were excluded from the assessment because they were categorized as LEP or had an IEP represented 4 percent and 4 percent of the population, respectively, in grades 4 and 8.

In total, 2,740 fourth-grade and 2,640 eighth-grade Pennsylvania public-school students were assessed in mathematics. The weighted **student** participation rate was 96 percent in grade 4 and 94 percent in grade 8. This means that the sample of students who took part in the assessment was representative of 96 percent and 94 percent of the **eligible** fourth-grade and eighth-grade public-school student populations in participating schools in Pennsylvania (that is, all students minus those excluded from the assessment).

The **overall** weighted response rate (school rate times student rate) was 91 percent in fourth grade and 89 percent in eighth grade. This means that the sample of students who participated in the assessment was representative of 91 percent and 89 percent of the eligible fourth- and eighth-grade public-school student populations in Pennsylvania, respectively.

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TABLE 1

Profile of Public-School Students in Pennsylvania, the Northeast region, and the Nation

		Grade 4	Grade 8	
		1992	1990	1992
DEMOGRAPHIC SUBGROUPS		**Percentage**	**Percentage**	**Percentage**
	RACE/ETHNICITY			
Pennsylvania	White	77 (1.6)	81 (2.5)	83 (1.4)
	Black	12 (1.6)	12 (2.3)	11 (1.6)
	Hispanic	7 (0.8)	5 (0.8)	3 (0.7)
	Asian	2 (0.4)	1 (0.2)	1 (0.3)
	American Indian	1 (0.3)	1 (0.3)	1 (0.3)
Northeast	White	71 (2.9)	80 (4.2)	67 (2.6) <
	Black	17 (2.7)	12 (4.2)	19 (1.5)
	Hispanic	8 (1.2)	5 (1.2)	10 (1.7)
	Asian	2 (0.7)	3 (1.1)	2 (0.5)
	American Indian	1 (0.3)	1 (0.3)	1 (0.3)
Nation	White	69 (0.4)	70 (0.5)	69 (0.4)
	Black	17 (0.4)	16 (0.3)	16 (0.2)
	Hispanic	10 (0.2)	10 (0.4)	10 (0.3)
	Asian	3 (0.3)	2 (0.5)	2 (0.2)
	American Indian	2 (0.2)	2 (0.7)	1 (0.2)
	TYPE OF COMMUNITY			
Pennsylvania	Advantaged Urban	15 (4.9)	12 (2.4)	4 (2.1) <
	Disadvantaged Urban	17 (3.4)	14 (3.3)	15 (3.5)
	Extreme Rural	14 (3.8)	7 (2.7)	13 (3.7)
	Other	54 (5.6)	67 (4.3)	68 (5.0)
Northeast	Advantaged Urban	20 (5.5)	23 (7.3)	12 (6.5)
	Disadvantaged Urban	16 (5.5)	8 (5.7)	12 (3.7)
	Extreme Rural	4 (1.2)	14 (10.3)	7 (4.8)
	Other	60 (8.0)	55 (11.2)	69 (8.2)
Nation	Advantaged Urban	9 (1.8)	10 (3.3)	8 (2.2)
	Disadvantaged Urban	10 (1.5)	10 (2.8)	9 (1.5)
	Extreme Rural	13 (2.4)	10 (3.0)	10 (2.8)
	Other	67 (3.2)	70 (4.4)	72 (3.5)
	PARENTS' EDUCATION			
Pennsylvania	Graduated college	37 (1.4)	35 (1.4)	39 (1.8)
	Some education after high school	9 (0.8)	20 (0.9)	19 (0.9)
	Graduated high school	16 (0.9)	34 (1.2)	30 (1.2)
	Did not finish high school	4 (0.4)	6 (0.6)	7 (0.8)
	I don't know	34 (1.2)	5 (0.6)	5 (0.5)
Northeast	Graduated college	44 (3.2)	49 (5.8)	38 (3.1)
	Some education after high school	6 (0.6)	15 (3.0)	18 (1.1)
	Graduated high school	11 (0.9)	23 (3.3)	26 (2.2)
	Did not finish high school	4 (0.7)	7 (2.2)	8 (0.9)
	I don't know	35 (2.0)	7 (1.5)	10 (1.2)
Nation	Graduated college	40 (1.1)	39 (1.9)	40 (1.4)
	Some education after high school	7 (0.4)	17 (0.9)	18 (0.6)
	Graduated high school	13 (0.6)	25 (1.2)	25 (0.8)
	Did not finish high school	4 (0.3)	10 (0.8)	8 (0.6)
	I don't know	36 (0.8)	9 (0.7)	9 (0.5)
	GENDER			
Pennsylvania	Male	53 (1.0)	51 (1.1)	50 (1.0)
	Female	47 (1.0)	49 (1.1)	50 (1.0)
Northeast	Male	50 (1.2)	50 (2.1)	53 (1.3)
	Female	50 (1.2)	50 (2.1)	47 (1.3)
Nation	Male	50 (0.7)	51 (1.1)	52 (0.6)
	Female	50 (0.7)	49 (1.1)	48 (0.6)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. The percentages for Race Ethnicity may not add to 100 percent because some students categorized themselves as "Other."

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TABLE 2

Profile of the Population Assessed in Pennsylvania

	Grade 4	Grade 8	
	1992	1990	1992
PUBLIC SCHOOL PARTICIPATION			
Weighted school participation rate before substitution	84%	90%	81%
Weighted school participation rate after substitution	95%	93%	94%
Number of schools originally sampled	116	106	107
Number of schools not eligible	0	4	2
Number of schools in original sample participating	99	92	84
Number of substitute schools provided	17	4	21
Number of substitute schools participating	12	3	15
Total number of participating schools	111	95	99
PUBLIC-SCHOOL STUDENT PARTICIPATION			
Weighted student participation rate after makeups	96%	94%	94%
Number of students selected to participate in the assessment	3,070	2,900	2,996
Number of students withdrawn from the assessment	90	77	63
Percentage of students who were of Limited English Proficiency	1%	1%	1%
Percentage of students excluded from the assessment due to Limited English Proficiency	1%	0%	0%
Percentage of students who had an Individualized Education Plan	8%	10%	9%
Percentage of students excluded from the assessment due to Individualized Education Plan status	3%	5%	4%
Number of students to be assessed	2,868	2,675	2,806
Number of students assessed	2,740	2,528	2,640
Overall weighted response rate	91%	88%	89%

In Pennsylvania in 1992, one or more eighth-grade schools in the original sample initially declined and then decided to participate after their substitute(s) had also agreed to participate, and assessments were conducted in both the original and substitute schools. For these cases, the substitute school is included in the number of substitute schools provided and in the number of substitute schools participating. The students in the substitute school(s) are included in the counts of students in the table; however, Pennsylvania's estimates are based on the student responses from the original school only.

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PART ONE

How Proficient in Mathematics Are Fourth- and Eighth-Grade Students in Pennsylvania Public Schools?

Both the 1990 and 1992 Trial State Assessments covered five mathematics content areas -- Numbers and Operations; Measurement; Geometry; Data Analysis, Statistics, and Probability; and Algebra and Functions. In addition, items measuring a sixth area -- Estimation -- were included in the 1992 Trial State Assessment. Estimation was covered in both the 1990 and 1992 national NAEP programs, but not the 1990 Trial State Assessment.

This part of the report contains two chapters that describe the mathematics proficiency of fourth- and eighth-grade public-school students in Pennsylvania. Chapter 1 compares the overall mathematics performance of the students in Pennsylvania to students in the Northeast region and the nation. It also presents students' average proficiency separately for each mathematics content area. Chapter 2 summarizes students' overall mathematics performance for subpopulations defined by race ethnicity, type of community, parents' education level, and gender, as well as their mathematics performance in the content areas. Both chapters also describe the change in performance of eighth-grade public-school students from 1990 to 1992 for those jurisdictions that participated in the Trial State Assessment in both years.

CHAPTER 1

Students' Mathematics Performance

Students' performance in mathematics was summarized on the NAEP mathematics scale, which ranges from 0 to 500. As shown in Table 3A:

Grade 4 1992

The average proficiency of public-school students from Pennsylvania on the NAEP mathematics scale was 223. This proficiency was higher than that of students across the nation (217).[11]

Grade 8 1992

The average proficiency of public-school students from Pennsylvania on the NAEP mathematics scale was 271. This proficiency was higher than that of students across the nation (266).

Grade 8 1990 vs 1992

The average proficiency of public-school students in Pennsylvania in 1992 was about the same as the average proficiency for 1990 (271 in 1992 and 266 in 1990).

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TABLE 3A | **Average Fourth-Grade and Eighth-Grade Public-School Mathematics Proficiency**

	Grade 4	Grade 8	
	1992	1990	1992
	Proficiency	**Proficiency**	**Proficiency**
Pennsylvania	223 (1.4)	266 (1.6)	271 (1.5)
Northeast	223 (2.1)	270 (3.3)	267 (3.0)
Nation	217 (0.8)	262 (1.4)	266 (1.0) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

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[11] Differences reported are statistically significant at the 95 percent confidence level. This means that with 95 percent confidence, there is a real difference in the average mathematics proficiency between the two populations of interest. "About the same" means that no statistically significant difference was found at the 95 percent confidence level.

There was also a tremendous range in student performance within each grade as shown by the percentile distributions presented in Table 3B.

Grade 4 1992

The lowest performing 10 percent of the students from Pennsylvania had proficiencies below 181 while the top 10 percent of the students had proficiencies above 262.

Grade 8 1992

The lowest performing 10 percent of the students in Pennsylvania had proficiencies below 225 while the top 10 percent of the students had proficiencies above 314.

Grade 8 1990 vs 1992

In Pennsylvania, the score that signified the 10th percentile in 1992 (225) was about the same as the score that signified the 10th percentile in 1990 (222). Similarly, the score that signified the 90th percentile in 1992 (314) was about the same as the score that signified the 90th percentile in 1990 (309).

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TABLE 3B

Percentiles of Mathematics Proficiency in Fourth- and Eighth-Grade Public Schools

	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
GRADE 4 1992							
Pennsylvania	169 (2.5)	181 (1.8)	202 (1.9)	225 (1.8)	246 (1.6)	262 (2.3)	272 (2.2)
Northeast	165 (3.1)	178 (3.1)	200 (2.6)	225 (3.4)	246 (3.4)	264 (3.8)	274 (3.0)
Nation	161 (1.5)	174 (0.7)	196 (1.0)	219 (0.9)	240 (1.3)	259 (1.1)	269 (2.0)
GRADE 8 1990							
Pennsylvania	208 (3.6)	222 (2.8)	244 (2.7)	267 (1.9)	290 (1.2)	309 (2.1)	320 (1.2)
Northeast	211 (5.4)	226 (4.2)	247 (2.9)	271 (4.9)	295 (4.6)	311 (3.4)	323 (6.5)
Nation	200 (1.6)	214 (1.8)	237 (1.7)	263 (1.4)	288 (1.7)	307 (1.9)	319 (1.8)
GRADE 8 1992							
Pennsylvania	212 (2.2)	225 (2.3)	248 (1.5)	272 (1.4)	295 (1.1) >	314 (1.8)	326 (1.8)
Northeast	205 (3.0)	217 (4.0)	240 (3.1)	266 (4.5)	295 (4.4)	318 (3.8)	332 (2.5)
Nation	205 (2.0)	218 (1.6)	241 (1.3)	267 (1.2)	292 (1.0)	313 (1.4)	325 (1.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

LEVELS OF MATHEMATICS ACHIEVEMENT

Average proficiency on the NAEP scale provides an overall depiction of students' mathematics achievement; however, by itself, it does not describe what students know and are able to do in the subjects, nor does it evaluate student performance against a standard. This report next presents a set of results based on applying the National Assessment Governing Board's standards to student performance on the mathematics scale.

When Congress established the National Assessment Governing Board (NAGB) in 1988 to set policy for NAEP, it charged the board with "identifying appropriate achievement goals for each age and grade in each subject area to be tested under the National Assessment." (Pub.L. 297-100, Section 3403 (a)(5)(B)(ii)). To carry out this responsibility, NAGB contracted with American College Testing (ACT) to undertake advisory and analytic functions that could assist the Board in forming its conclusions as to appropriate achievement levels to be used for evaluating the 1992 mathematics assessment results. Achievement levels are mappings of collective judgments about how students *should* perform onto the achievement scale.[12] Boundary points were developed for three achievement levels for each grade -- Basic, Proficient, and Advanced. Performance at the Basic level denotes partial mastery of the knowledge and skills that are fundamental for proficient work at each grade level. The central level, called Proficient, represents solid academic performance at each grade level tested. Students reaching this level demonstrate competency over challenging subject matter and are well prepared for the next level of schooling. Achievement at the Advanced level signifies superior performance at each of the grades tested.

In previous NAEP reports, a procedure known as scale anchoring was used to interpret or provide meaning to the scores.[13] Anchor points are not based on judgments of how much students should know or be able to do, and they do not differ by grade level. Instead, scale anchoring provides empirical descriptions of the types of procedural knowledge, mathematical skills, and problem-solving abilities that students need to answer items correctly at that level. These descriptions are based on a close examination by mathematics experts of the characteristics of the mathematics items that best discriminate those students performing at or near each of the anchor points from those performing at the next lower level. Unlike the achievement-level approach, the scale-anchoring procedure leaves to the reader the judgment as to whether the achievement demonstrated was adequate in terms of what students should be able to do. Table S1 in the Scale Anchoring Appendix of this report presents the percentages of students at or above each of the four anchor points (200, 250, 300, and 350 on the NAEP scale) for the total population and for selected population subgroups. A companion report, entitled *Interpreting NAEP Scales*, describes the development over the last two decades of various procedures for reporting NAEP data and explains the meaning and interpretation of the NAEP scales.

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[12] The Achievement Levels Appendix briefly describes the process of gathering expert judgments about Basic, Proficient, and Advanced performance -- as defined by NAGB policy -- on each mathematics item, combining the various judgments on the various items and mapping them onto the scale, and setting the scale score cutpoints for reporting purposes based on these levels.

[13] The Scale Anchoring Appendix provides definitions of each of four anchor points (200, 250, 300, and 350 on the NAEP scale) and briefly describes the process of identifying items that discriminate among students performing at adjacent levels and generalizing about the skills exemplified by those items.

This report follows NAGB's policy that achievement levels should be the primary and initial method of presenting the results of the 1992 Trial State Assessment. In this report, these achievement levels not only are applied to the 1992 data, showing the proportions of students that achieve the three achievement levels, they also are applied to data from the 1990 mathematics assessment, permitting a report on changes in percentages of students at or above each of the achievement levels.[14]

Definitions of the three levels of mathematics achievement are given in Figure 2. Table 4 provides the percentages of students at or above each of these achievement levels, as well as the percentage of students below the Basic level.

Grade 4 1992

More than half of the students in public schools in Pennsylvania (66 percent), versus 59 percent in the nation, are at or above the Basic level. About one quarter of the students in Pennsylvania (23 percent), versus 18 percent in the nation, are at or above the Proficient level. Relatively few of the students in Pennsylvania (3 percent), versus 2 percent in the nation, are at or above the Advanced level.

Grade 8 1992

More than half of the public-school students in Pennsylvania (67 percent), versus 61 percent in the nation, are at or above the Basic level, while about one quarter of the students in Pennsylvania (26 percent), versus 23 percent in the nation, are at or above the Proficient level, and relatively few of the students in Pennsylvania (3 percent), versus 3 percent in the nation, are at or above the Advanced level.

Grade 8 1990 vs 1992

Compared to 1990, there was no significant difference in the percentage of students in Pennsylvania at or above the Basic level (67 percent in 1992 compared to 63 percent in 1990), no significant difference in the percentage of students at or above the Proficient level (26 percent in 1992 compared to 21 percent in 1990), and no significant difference in the percentage of students at or above the Advanced level (3 percent in 1992 compared 2 percent in 1990).

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[14] The 1990 achievement levels used in this report reflect changes in the processes used to develop the original 1990 achievement levels. In consequence, the 1990 findings presented here differ from the results published earlier by NAGB in its report by Mary Lyn Bourque and Howard H. Garrison, entitled *The Levels of Mathematics Achievement. Initial Performance Standards for the 1990 NAEP Mathematics Assessment.* (Washington, DC: National Assessment Governing Board, 1991).

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FIGURE 2 | Levels of Mathematics Achievement

GRADE 4

NAEP content areas: (1) Numbers and Operations; (2) Measurement; (3) Geometry; (4) Data Analysis, Statistics, and Probability; (5) Algebra and Functions. (Note: At the fourth-grade level, algebra and functions are treated in informal and exploratory ways, often through the study of patterns.)

Skills are cumulative across levels -- from Basic to Proficient to Advanced.

BASIC LEVEL	**Fourth-grade students performing at the Basic level** ***should show some evidence of understanding the mathematical concepts and procedures in the five NAEP content areas.*** **In relation to the NAEP scale, Basic-level achievement for fourth grade is defined by proficiency scores at or above 211.**

Specifically, fourth graders performing at the Basic level should be able to estimate and use basic facts to perform simple computations with whole numbers, show some understanding of fractions and decimals, and solve simple real-world problems in all NAEP content areas. Students at this level should be able to use -- though not always accurately -- four-function calculators, rulers, and geometric shapes. Their written responses are often minimal and presented without supporting information.

PROFICIENT LEVEL	**Fourth-grade students performing at the Proficient level** ***should consistently apply integrated procedural knowledge and conceptual understanding to problem solving in the five NAEP content areas.*** **In relation to the NAEP scale, Proficient-level achievement for fourth grade is defined by proficiency scores at or above 248.**

Specifically, fourth graders performing at the Proficient level should be able to use whole numbers to estimate, compute, and determine whether results are reasonable. They should have a conceptual understanding of fractions and decimals; be able to solve real-world problems in all NAEP content areas; and use four-function calculators, rulers, and geometric shapes appropriately. Students at the Proficient level should employ problem-solving strategies such as identifying and using appropriate information. Their written solutions should be organized and presented both with supporting information and explanations of how they were achieved.

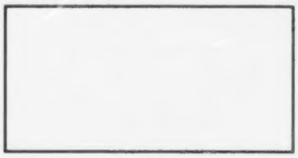
ADVANCED LEVEL	**Fourth-grade students performing at the Advanced level** ***should apply integrated procedural knowledge and conceptual understanding to complex and nonroutine real-world problem solving in the five NAEP content areas.*** **In relation to the NAEP scale, Advanced-level achievement for fourth grade is defined by proficiency scores at or above 280.**

Specifically, fourth graders performing at the Advanced level should be able to solve complex and nonroutine real-world problems in all NAEP content areas. They should display mastery in the use of four-function calculators, rulers, and geometric shapes. These students are expected to draw logical conclusions and justify answers and solution processes by explaining why, as well as how, they were achieved. They should go beyond the obvious in their interpretations and be able to communicate their thoughts clearly and concisely.

FIGURE 2 (continued) | Levels of Mathematics Achievement

Grade 4 Basic-Level Example Item

Refer to the rectangle below. (NOTE: Size reduced from original.)



Percent Correct	
State	53 (2.6)
Nation	50 (1.6)

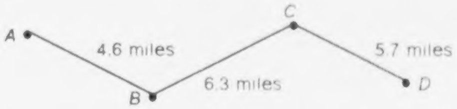
Use your centimeter ruler to make the following measurement to the nearest centimeter.

What is the length in centimeters of one of the longer sides of the rectangle?

Answer: (8 centimeters)

Grade 4 Proficient-Level Example Item

Carol wanted to estimate the distance from *A* to *D* along the path shown on the map below. She correctly rounded each of the given distances to the nearest mile and then added them. Which of the following sums could be hers?



A. 4 + 6 + 5 = 15
B. 5 + 6 + 5 = 16
*C. 5 + 6 + 6 = 17
D. 5 + 7 + 6 = 18

Percent Correct	
State	29 (2.2)
Nation	25 (1.7)

Grade 4 Advanced-Level Example Item

If ☐ represents the number of newspapers that Lee delivers each day,
which of the following represents the total number of newspapers that Lee delivers in 5 days?

A. 5 + ☐
*B. 5 x ☐
C. ☐ ÷ 5
D. (☐ + ☐) x 5

Percent Correct	
State	54 (2.6)
Nation	48 (1.4)

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TABLE 6A

Average Fourth-Grade and Eighth-Grade Public-School Mathematics Proficiency by Race/Ethnicity

		Grade 4	Grade 8	
		1992	1990	1992
		Proficiency	**Proficiency**	**Proficiency**
Pennsylvania				
	White	230 (1.2)	272 (1.1)	276 (1.1) >
	Black	192 (2.5)	239 (3.1)	237 (4.6)
	Hispanic	203 (2.3)	229 (4.5)	246 (3.9)! >
Northeast				
	White	232 (2.4)	274 (2.6)	279 (3.3)
	Black	194 (3.1)	246 (8.1)!	239 (3.8)
	Hispanic	200 (3.2)	*** (**.*)	241 (3.8)!
Nation				
	White	226 (1.0)	270 (1.5)	276 (1.1) >
	Black	191 (1.4)	237 (2.8)	236 (1.3)
	Hispanic	199 (1.5)	242 (2.8)	245 (1.3)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

FIGURE 2 (continued) | **Levels of Mathematics Achievement**

Grade 8 Basic-Level Example Item

Which of the following is both a multiple of 3 and a multiple of 7?

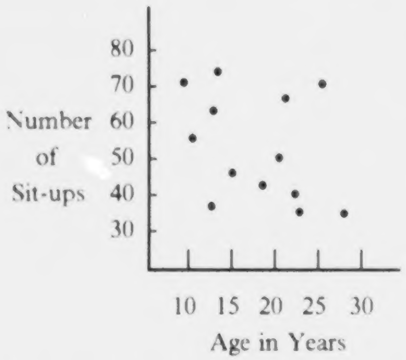
A. 7,007
B. 8,192
*C. 21,567
D. 22,287
E. 40,040

Did you use the calculator on this question?

Yes No

Percent Correct	
State	78 (1.7)
Nation	76 (1.3)

Grade 8 Proficient-Level Example Item



In the graph above, each dot shows the number of sit-ups and the corresponding age for one of 13 people. According to this graph, what is the median number of sit-ups for these 13 people?

A. 15
B. 20
C. 45
*D. 50
E. 55

Did you use the calculator on this question?

Yes No

Percent Correct	
State	21 (1.5)
Nation	23 (1.4)

FIGURE 2
(continued)

Levels of Mathematics Achievement

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Grade 8 Advanced-Level Example Item

A	*B*
2	5
4	9
6	13
8	17
⋮	⋮
14	?

If the pattern shown in the table were continued, what number would appear in the box at the bottom of column *B* next to 14?

A. 19
B. 21
C. 23
D. 25
*E. 29

Percent Correct	
State	26 (1.6)
Nation	25 (1.4)

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TABLE 4 | Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Achievement

Achievement Level		Grade 4	Grade 8	
		1992	1990	1992
		Percentage	Percentage	Percentage
At or Above Advanced Level	**Pennsylvania**	3 (0.5)	2 (0.4)	3 (0.7)
	Northeast	3 (0.8)	3 (1.0)	5 (1.4)
	Nation	2 (0.3)	2 (0.4)	3 (0.5)
At or Above Proficient Level	**Pennsylvania**	23 (1.5)	21 (1.5)	26 (1.5)
	Northeast	23 (2.9)	26 (3.1)	25 (3.0)
	Nation	18 (1.1)	19 (1.2)	23 (1.1) >
At or Above Basic Level	**Pennsylvania**	66 (1.9)	63 (2.0)	67 (1.7)
	Northeast	64 (3.0)	65 (3.7)	59 (3.9)
	Nation	59 (1.1)	57 (1.4)	61 (1.2)
Below Basic Level	**Pennsylvania**	34 (1.9)	37 (2.0)	33 (1.7)
	Northeast	36 (3.0)	35 (3.7)	41 (3.9)
	Nation	41 (1.1)	43 (1.4)	39 (1.2)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

Clearly, many students in Pennsylvania fail to meet or exceed the achievement levels that prescribe what students should know and should be able to do. Educators and policymakers will need to look to many sources of information and opinion for explanations of these levels of performance. Among the possible explanations, several factors should not be overlooked. First, students may not be learning enough in school to reach the achievement levels. In 1983, the National Commission on Excellence in Education warned that "the educational foundations of our society are being eroded by a rising tide of mediocrity that threatens our very future."[15] In 1990, the President and the Governors committed the Nation to six goals for education, the third of which called for American students to "leave grades four, eight and twelve having demonstrated competency in challenging subject matter." The political leaders of this Nation are dissatisfied with the performance of American students. These NAEP findings confirm that a great many American students are not yet performing at the high standards embodied in the achievement levels.

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[15] National Commission on Excellence in Education, *A Nation at Risk*. (Washington, DC: U.S. Department of Education, 1983). In 1988, then-Secretary Bennett reported that the "precipitous downward slide of previous decades has been arrested, and we have begun the long climb back to reasonable standards." (p. 1 in *American Education: Making it Work*. (Washington, DC: U.S. Department of Education, 1988).)

Second, some students may not be reaching the higher achievement levels because schools may not be teaching the elements of mathematics that are included on the NAEP assessment, and because the assessment may not be covering some elements of mathematics included in the school curriculum. No assessment or test can cover all the different areas of mathematics that are taught in school. The content coverage of the NAEP mathematics assessment was set by a consensus approach. Teachers, curriculum specialists, subject matter specialists, local school administrators, parents, and members of the general public actively participated in deciding what are the most important elements of mathematics to be included in the assessment and for students to learn.[16] Since 1990, the content coverage of the NAEP mathematics assessment has been moving toward closer alignment with the curriculum and evaluation standards recommended by the National Council of Teachers of Mathematics (NCTM).[17] The 1992 assessment has a greater emphasis on geometry and algebra and functions and less emphasis on numbers and operations than assessments prior to 1990. Included among the items are some constructed-response problem-solving questions that assess higher-level thinking skills that multiple-choice question formats cannot normally measure. The 1994 assessment will be even more closely aligned with the NCTM standards. Other evidence from NAEP, presented later in this report, indicates that many schools and teachers have not yet begun to follow the approach to teaching mathematics recommended by NCTM.

Third, the Basic, Proficient, and Advanced achievement levels reflect high performance standards for the 1992 NAEP mathematics scale. The establishment of achievement levels depends on securing a set of informed judgments of expectations for student educational performance and on summarizing the individual ratings into collective judgments. These expectations reflect the Board's policy definitions, which require that students at the central, Proficient level demonstrate "competency over challenging subject matter." The resulting standards are rigorous. The higher any standard is set, the fewer students will be able to reach that standard.

As measures of performance, both average proficiency scores and percentages of students who score above the critical achievement levels on the NAEP scale provide a valuable overall depiction of students' mathematics achievement. In order to present a closer look at how well students know particular areas of mathematics, the next section presents student performance in five content areas and Estimation.

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[16] NAEP Mathematics Consensus Project. *Mathematics Framework for the 1992 National Assessment of Educational Progress.* (Washington, DC: National Assessment Governing Board, 1992).

[17] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989).

CONTENT AREA PERFORMANCE

As previously indicated, the questions comprising the Trial State Assessment covered the content areas of Numbers and Operations; Measurement; Geometry; Data Analysis, Statistics, and Probability; and Algebra and Functions; as well as Estimation skills. Estimation was measured using a special paced audiotape that limited the amount of time students had to work on each question and made any direct calculations of answers difficult. The information from the Estimation section is intended to supplement the data obtained from the Numbers and Operations and the Measurement questions administered using the more traditional paper-and-pencil or calculator approaches. Table 5A (average proficiency) and Table 5B (percentile distribution) provide the Pennsylvania, Northeast, and national results for each area.

Grade 4 1992 Students in Pennsylvania performed higher than students in the nation in Numbers and Operations, Measurement, Data Analysis, Statistics, and Probability, and Algebra and Functions.

Grade 8 1992 Students in Pennsylvania performed higher than students in the nation in Measurement.

Grade 8 1990 vs 1992 Estimation was not included in the 1990 Trial State Assessment program. Therefore, change in eighth-grade performance is provided only for the five content areas. The performance of public-school students in Pennsylvania stayed about the same from 1990 to 1992 in all of the five content areas.

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TABLE 5A | Fourth-Grade and Eighth-Grade Public-School Content Area Performance

	Grade 4	Grade 8	
	1992	1990	1992
	Proficiency	Proficiency	Proficiency
Numbers and Operations			
Pennsylvania	221 (1.6)	270 (1.7)	274 (1.6)
Northeast	220 (2.2)	272 (2.9)	271 (2.7)
Nation	214 (0.9)	266 (1.3)	270 (0.9) >
Measurement			
Pennsylvania	229 (1.6)	264 (2.0)	271 (2.0)
Northeast	227 (2.3)	267 (4.2)	265 (3.9)
Nation	222 (0.9)	258 (1.6)	264 (1.3) >
Geometry			
Pennsylvania	223 (1.2)	263 (1.7)	265 (1.5)
Northeast	224 (2.2)	268 (3.3)	263 (3.1)
Nation	220 (0.7)	259 (1.4)	262 (1.0)
Data Analysis, Statistics, and Probability			
Pennsylvania	223 (1.5)	268 (1.9)	273 (1.8)
Northeast	223 (2.3)	273 (3.9)	269 (3.5)
Nation	218 (1.0)	262 (1.6)	267 (1.2)
Algebra and Functions			
Pennsylvania	221 (1.4)	265 (1.6)	270 (1.5)
Northeast	222 (2.2)	268 (3.3)	266 (2.8)
Nation	216 (0.9)	260 (1.3)	266 (1.1) >
Estimation Skills			
Pennsylvania	212 (1.6)	--- (--.-)	272 (1.3)
Northeast	205 (6.8)!	--- (--.-)	269 (5.1)
Nation	206 (1.8)	--- (--.-)	269 (1.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. --- Estimation was not included in the 1990 Trial State Assessment. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic.

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TABLE 5B | Percentiles of Mathematics Proficiency in Fourth- and Eighth-Grade Public Schools by Content Area

	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
GRADE 4 1992							
Numbers and Operations							
Pennsylvania	163 (2.9)	176 (2.0)	199 (1.9)	223 (2.1)	245 (1.7)	263 (1.7)	273 (3.1)
Northeast	157 (5.3)	172 (2.5)	196 (2.9)	222 (3.4)	246 (2.7)	265 (2.9)	277 (4.4)
Nation	154 (1.3)	168 (1.2)	191 (1.2)	215 (1.1)	239 (0.9)	259 (1.4)	270 (1.8)
Measurement							
Pennsylvania	169 (4.9)	183 (1.8)	207 (2.7)	230 (1.5)	253 (1.2)	271 (1.8)	281 (2.8)
Northeast	166 (2.9)	181 (3.1)	203 (3.2)	229 (3.5)	252 (3.0)	271 (3.6)	281 (3.0)
Nation	162 (1.8)	176 (1.3)	199 (1.1)	224 (0.9)	247 (1.6)	266 (1.3)	277 (1.4)
Geometry							
Pennsylvania	172 (2.2)	185 (2.3)	204 (1.9)	224 (1.3)	244 (1.2)	262 (2.[illegible]	272 (1.2)
Northeast	171 (3.7)	183 (2.2)	202 (2.8)	225 (2.8)	247 (2.8)	265 (1.0)	273 (1.9)
Nation	167 (1.7)	179 (1.1)	199 (0.9)	221 (1.2)	242 (1.0)	260 (1.2)	270 (0.8)
Data Analysis, Statistics, and Probability							
Pennsylvania	167 (3.0)	180 (1.5)	202 (1.9)	226 (1.7)	246 (1.7)	263 (1.5)	273 (1.5)
Northeast	162 (2.7)	176 (3.3)	200 (2.9)	225 (3.9)	248 (4.1)	265 (3.2)	276 (3.4)
Nation	160 (1.2)	173 (2.0)	196 (1.0)	220 (1.5)	242 (1.5)	260 (1.4)	270 (1.9)
Algebra and Functions							
Pennsylvania	165 (2.9)	178 (2.4)	200 (2.3)	223 (2.0)	245 (2.0)	262 (1.4)	272 (1.8)
Northeast	162 (2.3)	177 (2.2)	200 (3.0)	224 (3.4)	246 (3.9)	265 (3.0)	276 (3.4)
Nation	158 (1.5)	171 (1.5)	193 (1.0)	217 (1.4)	239 (1.5)	258 (1.4)	269 (1.4)
Estimation Skills							
Pennsylvania	148 (3.3)	164 (4.1)	169 (2.1)	215 (1.5)	239 (1.8)	257 (1.6)	268 (2.6)
Northeast	138 (7.7)	152 (7.5)	177 (6.2)	205 (11.1)	236 (9.0)	256 (8.2)	266 (7.6)
Nation	144 (3.0)	157 (5.2)	182 (1.8)	207 (2.0)	232 (2.5)	252 (2.1)	263 (2.4)
GRADE 8 1990							
Numbers and Operations							
Pennsylvania	215 (2.1)	227 (2.4)	249 (2.3)	271 (2.1)	293 (2.0)	310 (2.0)	321 (1.7)
Northeast	216 (9.3)	231 (3.0)	250 (4.1)	273 (4.0)	297 (3.2)	313 (4.4)	323 (3.7)
Nation	206 (2.3)	220 (2.4)	242 (2.3)	267 (1.2)	291 (1.4)	309 (1.3)	320 (1.9)
Measurement							
Pennsylvania	190 (4.4)	207 (6.7)	236 (2.4)	265 (1.9)	294 (2.3)	320 (2.5)	335 (3.2)
Northeast	197 (4.0)	215 (5.9)	240 (2.8)	267 (5.8)	294 (3.9)	317 (5.2)	331 (4.3)
Nation	185 (3.2)	202 (1.9)	230 (2.7)	259 (2.2)	288 (2.2)	312 (2.3)	326 (2.1)
Geometry							
Pennsylvania	204 (4.9)	219 (3.5)	241 (1.9)	264 (1.7)	286 (2.0)	305 (1.5)	317 (2.2)
Northeast	210 (8.8)	225 (6.2)	246 (3.9)	270 (2.5)	290 (4.8)	309 (2.3)	321 (3.6)
Nation	199 (2.5)	213 (2.0)	236 (1.7)	260 (1.2)	284 (1.4)	303 (1.9)	316 (4.1)
Data Analysis, Statistics, and Probability							
Pennsylvania	204 (4.4)	219 (3.6)	244 (2.9)	269 (2.5)	293 (1.2)	313 (1.5)	325 (1.4)
Northeast	207 (4.7)	224 (9.8)	248 (4.8)	275 (3.3)	300 (5.9)	320 (2.6)	332 (4.7)
Nation	191 (2.3)	207 (3.1)	234 (2.0)	264 (1.4)	292 (1.4)	313 (1.6)	326 (1.8)
Algebra and Functions							
Pennsylvania	205 (3.8)	219 (3.2)	242 (2.0)	266 (1.9)	290 (2.0)	310 (1.8)	320 (2.2)
Northeast	210 (5.4)	223 (4.8)	244 (5.1)	268 (4.8)	292 (4.8)	311 (3.1)	323 (5.5)
Nation	199 (1.9)	212 (2.6)	235 (1.7)	261 (1.5)	286 (1.6)	308 (2.6)	322 (2.7)
Estimation Skills							
Pennsylvania	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)
Northeast	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)
Nation	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)	--- (--.-)

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TABLE 5B
(continued)

Percentiles of Mathematics Proficiency in Fourth- and Eighth-Grade Public Schools by Content Area

	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
GRADE 8 1992							
Numbers and Operations							
Pennsylvania	219 (4.5)	231 (2.3)	252 (1.5)	275 (1.8)	296 (1.5)	315 (2.4)	324 (1.6)
Northeast	211 (4.1)	223 (1.7)	246 (2.9)	270 (3.7)	297 (3.4)	319 (2.5)	330 (2.4)
Nation	211 (1.5)	223 (0.8)	246 (0.9)	271 (1.3)	295 (1.0)	315 (1.4)	326 (1.5)
Measurement							
Pennsylvania	201 (4.0)	217 (4.2)	244 (2.3)	272 (2.4)	300 (2.3)	325 (3.4)	340 (2.6)
Northeast	188 (4.7)	204 (5.3)	231 (4.2)	263 (4.4)	298 (3.9)	328 (3.1)	343 (2.8)
Nation	190 (2.1)	208 (1.3)	233 (1.4)	265 (1.5)	296 (1.6)	323 (2.8)	338 (1.9) >
Geometry							
Pennsylvania	205 (3.1)	219 (3.1)	242 (1.9)	266 (1.5)	289 (1.6)	309 (1.9)	321 (3.8)
Northeast	203 (3.6)	215 (4.2)	237 (2.8)	262 (2.5)	289 (2.6)	312 (3.9)	324 (6.2)
Nation	204 (1.7)	216 (1.0)	238 (1.4)	262 (1.1)	286 (1.0)	307 (1.4)	318 (1.8)
Data Analysis, Statistics, and Probability							
Pennsylvania	206 (4.5)	221 (2.5)	247 (2.0)	275 (1.9)	300 (1.9)	322 (1.9) >	334 (2.6)
Northeast	198 (4.0)	213 (4.1)	238 (3.2)	268 (3.0)	300 (5.0)	326 (4.9)	340 (4.7)
Nation	196 (1.8)	212 (1.3)	236 (1.4)	268 (1.4)	297 (1.6)	320 (1.9)	333 (2.6)
Algebra and Functions							
Pennsylvania	209 (3.3)	223 (2.5)	246 (2.3)	271 (1.9)	295 (2.0)	315 (2.0)	326 (3.5)
Northeast	203 (1.3)	216 (2.9)	239 (2.6)	266 (3.8)	294 (3.7)	319 (2.7)	333 (2.9)
Nation	204 (1.6)	218 (1.5)	240 (1.3)	266 (1.3)	291 (1.4)	314 (2.1)	327 (2.4)
Estimation Skills							
Pennsylvania	225 (2.4)	236 (1.7)	254 (1.7)	273 (1.4)	291 (1.8)	307 (1.5)	317 (1.9)
Northeast	210 (5.0)	222 (3.9)	244 (10.7)	272 (5.2)	294 (6.8)	311 (7.4)	319 (7.0)
Nation	221 (3.1)	232 (1.9)	250 (1.9)	271 (1.5)	290 (1.5)	305 (2.3)	314 (1.9)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. — Estimation was not included in the 1990 Trial State Assessment.

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CHAPTER 2

Mathematics Performance by Subpopulations

Many of the reforms recommended for mathematics education have emphasized the need to stress mathematics for all students.[18] Nevertheless, assessment results consistently show lower achievement for subpopulations of students who are less advantaged than their classmates.[19] The 1992 Trial State Assessment sheds further light on this by reporting on the performance of various subgroups of the student population defined by race ethnicity, type of community, parents' education level, and gender.

RACE/ETHNICITY

The Trial State Assessment results can be compared according to racial ethnic groups when the number of students in a racial ethnic group was sufficient in size to be reliably reported (at least 62 students). Table 6A (average proficiency) and Table 6B (percentile distribution) present fourth-grade mathematics performance results for White, Black, and Hispanic students, and eighth-grade mathematics performance results for White, Black, and Hispanic students from Pennsylvania.

In Pennsylvania:

Grade 4 1992 White students demonstrated higher average mathematics proficiency than did Black or Hispanic students.

Grade 8 1992 White students demonstrated higher average mathematics proficiency than did Black or Hispanic students.

Grade 8 1990 vs 1992 The performance of White and Hispanic students was higher in 1992 than it was in 1990. The performance of Black students stayed about the same from 1990 to 1992.

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[18] *Everybody Counts A Report to the Nation on the Future of Mathematics Education*, Lynn Steen, Ed (Washington, DC National Research Council, National Academy Press, 1989)

[19] Ina V.S. Mullis, John A. Dossey, Eugene H. Owen, and Gary W. Phillips. *The State of Mathematics Achievement NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States* (Washington, DC National Center for Education Statistics, 1991).

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TABLE 6A

Average Fourth-Grade and Eighth-Grade Public-School Mathematics Proficiency by Race/Ethnicity

		Grade 4	Grade 8	
		1992	1990	1992
		Proficiency	**Proficiency**	**Proficiency**
Pennsylvania				
	White	230 (1.2)	272 (1.1)	276 (1.1) >
	Black	192 (2.5)	239 (3.1)	237 (4.6)
	Hispanic	203 (2.3)	229 (4.5)	246 (3.9)! >
Northeast				
	White	232 (2.4)	274 (2.6)	279 (3.3)
	Black	194 (3.1)	246 (8.1)!	239 (3.8)
	Hispanic	200 (3.2)	*** (**.*)	241 (3.8)!
Nation				
	White	226 (1.0)	270 (1.5)	276 (1.1) >
	Black	191 (1.4)	237 (2.8)	236 (1.3)
	Hispanic	199 (1.5)	242 (2.8)	245 (1.3)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE 6B

Percentiles of Mathematics Proficiency in Fourth- and Eighth-Grade Public Schools by Race/Ethnicity

	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
GRADE 4 1992							
White							
Pennsylvania	182 (3.1)	194 (1.6)	212 (1.7)	231 (1.4)	250 (1.1)	265 (2.1)	274 (2.4)
Northeast	181 (3.2)	193 (2.6)	212 (3.5)	234 (3.1)	253 (2.1)	269 (3.9)	279 (3.3)
Nation	175 (2.3)	187 (1.3)	207 (1.2)	227 (1.1)	246 (1.4)	263 (1.2)	272 (1.4)
Black							
Pennsylvania	148 (3.0)	158 (3.9)	174 (4.3)	192 (3.4)	211 (2.9)	228 (2.6)	238 (2.2)
Northeast	141 (11.4)	154 (14.1)	173 (3.7)	194 (7.0)	213 (3.2)	232 (5.2)	242 (4.2)
Nation	142 (3.4)	153 (2.9)	171 (2.3)	191 (2.6)	210 (1.7)	227 (1.8)	237 (3.1)
Hispanic							
Pennsylvania	152 (5.2)	162 (4.5)	183 (3.5)	203 (2.2)	223 (3.7)	244 (5.7)	255 (4.2)
Northeast	151 (8.7)	164 (7.1)	184 (2.9)	199 (3.8)	217 (8.0)	235 (7.5)	246 (3.1)
Nation	148 (4.5)	160 (2.7)	179 (1.0)	200 (1.9)	219 (1.8)	238 (2.4)	248 (3.5)
GRADE 8 1990							
White							
Pennsylvania	220 (2.2)	232 (1.6)	251 (1.3)	273 (1.2)	294 (1.2)	311 (1.8)	322 (1.5)
Northeast	220 (6.5)	234 (3.0)	252 (3.6)	275 (3.2)	297 (3.4)	312 (4.0)	326 (7.0)
Nation	213 (2.2)	226 (1.3)	248 (1.8)	271 (2.1)	293 (1.6)	311 (2.5)	324 (3.7)
Black							
Pennsylvania	190 (6.4)	202 (3.2)	218 (3.7)	238 (3.5)	259 (4.9)	280 (3.7)	290 (8.4)
Northeast	189 (13.0)	197 (9.0)	222 (9.4)	245 (7.3)	270 (21.3)	295 (11.0)	305 (12.2)
Nation	184 (5.3)	194 (7.5)	214 (5.3)	236 (1.7)	259 (3.0)	284 (3.5)	298 (3.2)
Hispanic							
Pennsylvania	172 (6.3)	180 (7.7)	203 (7.8)	233 (7.0)	251 (4.7)	271 (21.0)	287 (7.7)
Northeast	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	185 (2.5)	198 (2.5)	218 (2.9)	243 (5.5)	268 (2.3)	284 (2.3)	297 (6.1)

(continued on next page)

TABLE 6B
(continued)

Percentiles of Mathematics Proficiency in Fourth- and Eighth-Grade Public Schools by Race/Ethnicity

	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
GRADE 8 1992							
White							
Pennsylvania	223 (1.7)	235 (1.4)	254 (1.6)	276 (1.6)	298 (1.1)	317 (1.9)	328 (3.3)
Northeast	221 (4.9)	232 (3.5)	252 (4.5)	280 (3.9)	304 (3.4)	324 (6.5)	335 (7.3)
Nation	221 (1.6)	233 (1.3) >	254 (1.5)	277 (1.3)	299 (1.2) >	318 (2.1)	329 (2.0)
Black							
Pennsylvania	181 (12.5)	196 (6.0)	215 (5.6)	235 (6.9)	258 (6.5)	281 (11.7)	296 (10.8)
Northeast	187 (13.2)	200 (5.8)	217 (5.3)	240 (4.1)	258 (2.7)	275 (8.4)	290 (10.2)
Nation	187 (3.0)	197 (2.1)	215 (1.7)	236 (1.6)	257 (1.5)	275 (3.4)	286 (3.8)
Hispanic							
Pennsylvania	192 (9.1)	202 (6.1)	223 (7.2)	246 (4.0)	268 (14.0)	289 (5.7)	299 (16.7)
Northeast	180 (19.1)	196 (5.4)	216 (7.1)	239 (4.6)	266 (5.5)	288 (6.8)	302 (13.3)
Nation	189 (2.3)	201 (1.8)	221 (1.6)	244 (2.0)	268 (1.8)	289 (1.5)	301 (4.8)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

Table 7 presents mathematics performance by achievement levels. For Pennsylvania:

Grade 4 1992 About one quarter of the White students (27 percent), relatively few of the Black students (2 percent), and relatively few of the Hispanic students (8 percent) were at or above the Proficient level.

Grade 8 1992 About one quarter of the White students (29 percent), relatively few of the Black students (6 percent), and relatively few of the Hispanic students (8 percent) were at or above the Proficient level.

Grade 8 1990 vs 1992 About the same percentage of White, Black, and Hispanic students were at or above the Proficient level in 1992 as in 1990.

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TABLE 7

Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Achievement by Race/Ethnicity

	Grade 4	Grade 8	
	1992	1990	1992
	Percentage	Percentage	Percentage
At or Above Advanced Level			
Pennsylvania			
White	3 (0.7)	2 (0.4)	4 (0.7)
Black	0 (0.1)	0 (0.0)	0 (0.6)
Hispanic	1 (0.7)	0 (0.0)	0 (1.4)!
Northeast			
White	4 (1.2)	4 (1.2)	7 (1.7)
Black	0 (0.2)	0 (1.1)!	1 (1.7)
Hispanic	0 (0.7)	*** (**.*)	1 (0.6)!
Nation			
White	3 (0.4)	3 (0.6)	4 (0.6)
Black	0 (0.1)	0 (0.3)	0 (0.4)
Hispanic	0 (0.3)	0 (0.2)	1 (0.3)
At or Above Proficient Level			
Pennsylvania			
White	27 (1.6)	25 (1.3)	29 (1.4)
Black	2 (0.9)	3 (2.5)	6 (4.1)
Hispanic	8 (2.4)	4 (2.0)	8 (3.9)!
Northeast			
White	31 (3.8)	28 (2.9)	34 (3.8)
Black	3 (1.5)	10 (6.6)!	4 (2.7)
Hispanic	5 (1.5)	*** (**.*)	7 (2.5)!
Nation			
White	23 (1.5)	24 (1.6)	30 (1.4) >
Black	2 (0.7)	6 (1.3)	3 (0.8)
Hispanic	5 (1.0)	6 (1.6)	7 (0.9)
At or Above Basic Level			
Pennsylvania			
White	76 (1.7)	70 (1.3)	73 (1.4)
Black	25 (2.8)	29 (4.6)	28 (5.0)
Hispanic	39 (3.7)	20 (4.3)	38 (5.6)!
Northeast			
White	76 (3.4)	71 (2.9)	72 (3.9)
Black	29 (4.0)	36 (7.5)!	28 (5.3)
Hispanic	33 (5.9)	*** (**.*)	33 (5.5)!
Nation			
White	71 (1.4)	67 (1.6)	73 (1.4) >
Black	24 (1.9)	27 (3.1)	26 (2.2)
Hispanic	35 (2.3)	36 (3.1)	37 (2.1)

(continued on next page)

TABLE 7 (continued)

Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Achievement by Race/Ethnicity

		Grade 4	Grade 8	
		1992	1990	1992
Below Basic Level		Percentage	Percentage	Percentage
Pennsylvania				
	White	24 (1.7)	30 (1.3)	27 (1.4)
	Black	75 (2.8)	71 (4.6)	72 (5.0)
	Hispanic	61 (3.7)	80 (4.3)	62 (5.6)!
Northeast				
	White	24 (3.4)	29 (2.9)	28 (3.9)
	Black	71 (4.0)	64 (7.5)!	72 (5.3)
	Hispanic	67 (5.9)	*** (**.*)	67 (5.5)!
Nation				
	White	29 (1.4)	33 (1.6)	27 (1.4) <
	Black	76 (1.9)	73 (3.1)	74 (2.2)
	Hispanic	65 (2.3)	64 (3.1)	63 (2.1)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

TYPE OF COMMUNITY

Table 8A (average proficiency) and Table 8B (percentile distribution) present the mathematics proficiency results for fourth-grade students attending public schools in advantaged urban areas, disadvantaged urban areas, extreme rural areas, and areas classified as "other" and for eighth-grade students attending public schools in advantaged urban areas, disadvantaged urban areas, extreme rural areas, and areas classified as "other". (These are the "type of community" groups in Pennsylvania with student samples large enough to be reliably reported.)

In Pennsylvania:

Grade 4 1992

Students attending schools in advantaged urban areas demonstrated higher average mathematics proficiency than did students attending schools in disadvantaged urban areas and about the same mathematics proficiency as did students attending schools in extreme rural areas or areas classified as "other".

Grade 8 1992

Students attending schools in advantaged urban areas demonstrated higher average mathematics proficiency than did students attending schools in disadvantaged urban areas or areas classified as "other" and about the same mathematics proficiency as did students attending schools in extreme rural areas.

Grade 8 1990 vs 1992

The performance of students in areas classified as "other" was higher in 1992 than it was in 1990. Students in advantaged urban areas, disadvantaged urban areas, and extreme rural areas performed about the same in 1992 as in 1990.

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TABLE 8A

Average Fourth-Grade and Eighth-Grade Public-School Mathematics Proficiency by Type of Community

		Grade 4	Grade 8	
		1992	1990	1992
		Proficiency	**Proficiency**	**Proficiency**
Pennsylvania				
	Advantaged urban	237 (4.4)!	288 (2.5)!	289 (5.5)!
	Disadvantaged urban	196 (3.7)	245 (5.5)!	245 (5.1)!
	Extreme rural	230 (1.5)!	268 (3.2)!	277 (4.0)!
	Other	226 (1.5)	267 (1.5)	275 (1.3) >
Northeast				
	Advantaged urban	243 (3.3)!	280 (8.9)!	292 (6.7)!
	Disadvantaged urban	206 (3.6)!	244 (12.8)!	234 (2.3)!
	Extreme rural	*** (**.*)	*** (**.*)	*** (**.*)
	Other	220 (2.4)	273 (3.5)	267 (2.9)
Nation				
	Advantaged urban	240 (3.0)!	281 (4.2)!	285 (4.6)!
	Disadvantaged urban	193 (2.9)	250 (3.8)!	239 (2.7)
	Extreme rural	216 (3.6)	256 (4.5)!	267 (4.6)!
	Other	218 (1.0)	262 (1.8)	268 (1.2) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

Table 9 presents mathematics performance by achievement levels. In Pennsylvania:

Grade 4 1992

Less than half of the students attending schools in advantaged urban areas (38 percent), relatively few of the students in disadvantaged urban areas (5 percent), about one quarter of the students in extreme rural areas (26 percent), and about one quarter of the students in areas classified as "other" (23 percent) were at or above the Proficient level.

Grade 8 1992

About half of the students attending schools in advantaged urban areas (47 percent), relatively few of the students in disadvantaged urban areas (9 percent), about one quarter of the students in extreme rural areas (29 percent), and about one quarter of the students in areas classified as "other" (29 percent) were at or above the Proficient level.

Grade 8 1990 vs 1992

A greater percentage of students in areas classified as "other" were at or above the Proficient level in 1992 than in 1990. About the same percentage of students in advantaged urban areas, disadvantaged urban areas, and extreme rural areas were at or above the Proficient level in 1992 as in 1990.

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TABLE 8B | Percentiles of Mathematics Proficiency in Fourth- and Eighth-Grade Public Schools by Type of Community

	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
GRADE 4 1992							
Advantaged urban							
Pennsylvania	182 (5.9)	197 (7.4)	219 (5.5)	239 (6.5)	258 (4.5)	274 (2.3)	284 (5.1)
Northeast	195 (4.2)	204 (3.0)	221 (7.2)	243 (3.3)	264 (5.1)	280 (3.5)	289 (7.3)
Nation	188 (5.0)	200 (4.0)	220 (4.2)	241 (2.4)	261 (3.4)	279 (7.5)	290 (2.8)
Disadvantaged urban							
Pennsylvania	147 (5.4)	158 (4.0)	174 (4.6)	195 (3.0)	217 (3.0)	236 (4.5)	247 (10.1)
Northeast	161 (15.9)	170 (6.5)	188 (2.5)	205 (2.0)	224 (4.3)	241 (4.6)	254 (3.4)
Nation	143 (4.6)	153 (6.4)	173 (3.3)	194 (3.9)	213 (3.3)	231 (4.6)	242 (3.8)
Extreme rural							
Pennsylvania	187 (2.9)	196 (5.8)	212 (1.3)	229 (3.1)	249 (2.0)	263 (1.4)	273 (2.8)
Northeast	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	160 (4.4)	171 (3.6)	194 (7.8)	219 (4.7)	238 (2.5)	255 (4.9)	265 (3.2)
Other							
Pennsylvania	179 (1.9)	190 (1.9)	207 (1.7)	227 (1.6)	246 (2.1)	262 (2.0)	271 (1.7)
Northeast	160 (3.0)	174 (4.4)	199 (4.3)	224 (2.8)	244 (3.9)	260 (2.0)	268 (4.2)
Nation	165 (2.4)	177 (1.2)	198 (1.5)	220 (1.1)	240 (1.2)	257 (1.2)	267 (1.0)
GRADE 8 1990							
Advantaged urban							
Pennsylvania	238 (2.2)	248 (3.3)	267 (5.9)	288 (2.6)	309 (2.7)	327 (3.2)	341 (5.7)
Northeast	221 (17.1)	242 (5.5)	259 (10.1)	281 (9.8)	302 (6.5)	318 (14.9)	330 (11.9)
Nation	220 (7.3)	238 (6.6)	260 (4.0)	282 (5.9)	304 (6.0)	322 (8.0)	333 (4.5)
Disadvantaged urban							
Pennsylvania	185 (4.0)	199 (5.2)	220 (6.5)	245 (5.1)	270 (8.6)	292 (8.7)	306 (8.1)
Northeast	188 (17.6)	196 (11.1)	221 (7.5)	242 (10.3)	269 (13.8)	298 (10.3)	307 (19.7)
Nation	193 (4.1)	204 (5.6)	226 (4.4)	249 (5.0)	273 (5.4)	298 (7.3)	311 (6.9)
Extreme rural							
Pennsylvania	217 (7.8)	228 (7.0)	248 (5.3)	269 (2.1)	290 (4.2)	303 (1.3)	313 (9.8)
Northeast	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	201 (16.5)	215 (5.6)	236 (7.1)	256 (4.9)	280 (5.1)	299 (3.4)	308 (8.0)
Other							
Pennsylvania	214 (3.0)	227 (1.6)	247 (1.5)	268 (1.8)	289 (1.7)	307 (1.7)	317 (1.7)
Northeast	216 (10.1)	231 (5.0)	250 (6.3)	274 (4.9)	297 (3.4)	313 (2.8)	325 (7.6)
Nation	200 (3.2)	213 (2.0)	237 (2.4)	263 (1.8)	288 (1.5)	306 (2.1)	318 (2.5)
GRADE 8 1992							
Advantaged urban							
Pennsylvania	228 (4.6)	242 (5.6)	269 (9.6)	292 (7.9)	311 (6.2)	332 (4.5)	339 (3.7)
Northeast	226 (4.0)	246 (11.3)	270 (4.3)	294 (12.6)	319 (4.2)	334 (9.3)	342 (9.7)
Nation	219 (2.0)	235 (6.9)	261 (3.2)	288 (6.1)	311 (5.2)	330 (3.7)	339 (4.0)
Disadvantaged urban							
Pennsylvania	187 (11.5)	201 (4.6)	221 (5.7)	243 (4.2)	268 (5.6)	292 (6.3)	305 (6.6)
Northeast	189 (27.7)	199 (4.9)	215 (2.1)	236 (1.4)	253 (3.9)	268 (6.0)	281 (9.9)
Nation	184 (6.7)	195 (3.1)	216 (2.6)	237 (2.0)	259 (4.6)	284 (6.6)	299 (6.1)
Extreme rural							
Pennsylvania	225 (6.3)	235 (5.3)	255 (4.7)	278 (3.4)	297 (4.7)	318 (9.7)	327 (7.9)
Northeast	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	211 (7.2)	223 (3.2)	245 (6.6)	268 (5.1)	290 (4.4)	309 (5.7)	319 (4.6)
Other							
Pennsylvania	222 (2.7)	234 (2.0)	254 (1.1) >	275 (1.5) >	297 (1.3) >	316 (2.4)	326 (2.0) >
Northeast	206 (7.5)	219 (4.6)	241 (3.6)	265 (2.6)	294 (4.5)	316 (2.6)	330 (5.3)
Nation	208 (2.5)	221 (1.2) >	243 (1.9)	268 (1.8)	293 (1.2)	313 (1.4)	325 (1.6)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE 9

Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Achievement by Type of Community

		Grade 4	Grade 8	
		1992	1990	1992
		Percentage	Percentage	Percentage
At or Above Advanced Level				
Pennsylvania				
	Advantaged urban	7 (2.4)!	8 (1.8)!	11 (1.8)!
	Disadvantaged urban	0 (0.2)	1 (0.7)!	1 (0.8)!
	Extreme rural	3 (0.7)!	1 (0.8)!	4 (1.8)!
	Other	2 (0.8)	2 (0.5)	3 (0.9)
Northeast				
	Advantaged urban	10 (3.4)!	5 (4.6)!	13 (5.2)!
	Disadvantaged urban	1 (0.3)!	0 (1.0)!	0 (0.3)!
	Extreme rural	*** (**.*)	*** (**.*)	*** (**.*)
	Other	2 (0.7)	4 (1.1)	5 (1.3)
Nation				
	Advantaged urban	10 (2.4)!	6 (2.5)!	9 (3.1)!
	Disadvantaged urban	0 (0.2)	1 (0.7)!	1 (0.4)
	Extreme rural	1 (0.5)	1 (0.7)!	2 (1.0)!
	Other	2 (0.3)	2 (0.4)	3 (0.5)
At or Above Proficient Level				
Pennsylvania				
	Advantaged urban	38 (5.8)!	43 (3.4)!	47 (11.7)!
	Disadvantaged urban	5 (1.6)	9 (2.8)!	9 (2.8)!
	Extreme rural	26 (3.3)!	20 (4.3)!	29 (5.7)!
	Other	23 (1.8)	20 (1.8)	29 (1.8) >
Northeast				
	Advantaged urban	44 (5.7)!	34 (8.5)!	50 (9.5)!
	Disadvantaged urban	6 (2.1)!	11 (14.0)!	3 (1.6)!
	Extreme rural	*** (**.*)	*** (**.*)	*** (**.*)
	Other	21 (3.4)	28 (3.5)	25 (3.4)
Nation				
	Advantaged urban	41 (4.5)!	36 (4.2)!	44 (5.6)!
	Disadvantaged urban	3 (1.0)	12 (3.5)!	7 (1.5)
	Extreme rural	15 (2.3)	13 (3.6)!	21 (3.8)!
	Other	17 (1.2)	19 (1.3)	24 (1.2)
At or Above Basic Level				
Pennsylvania				
	Advantaged urban	82 (4.5)!	84 (2.4)!	82 (6.7)!
	Disadvantaged urban	32 (5.0)	37 (7.0)!	36 (6.2)!
	Extreme rural	77 (2.6)!	68 (4.1)!	74 (4.0)!
	Other	70 (2.2)	65 (2.0)	73 (1.5) >
Northeast				
	Advantaged urban	83 (3.3)!	78 (8.9)!	84 (4.4)!
	Disadvantaged urban	40 (5.1)!	35 (7.9)!	20 (4.6)!
	Extreme rural	*** (**.*)	*** (**.*)	*** (**.*)
	Other	64 (3.6)	69 (4.0)	59 (3.6)
Nation				
	Advantaged urban	82 (3.2)!	78 (4.3)!	79 (3.7)!
	Disadvantaged urban	27 (3.3)	43 (4.2)!	28 (3.2)
	Extreme rural	60 (5.2)	50 (5.7)!	65 (6.2)!
	Other	61 (1.4)	58 (2.0)	63 (1.6)

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TABLE 9 (continued)

Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Achievement by Type of Community

		Grade 4	Grade 8	
		1992	1990	1992
		Percentage	**Percentage**	**Percentage**
Below Basic Level				
Pennsylvania				
	Advantaged urban	18 (4.5)!	16 (2.4)!	18 (6.7)!
	Disadvantaged urban	68 (5.0)	63 (7.0)!	64 (6.2)!
	Extreme rural	23 (2.6)!	32 (4.1)!	26 (4.0)!
	Other	30 (2.2)	35 (2.0)	27 (1.5) <
Northeast				
	Advantaged urban	17 (3.3)!	22 (8.9)!	16 (4.4)!
	Disadvantaged urban	60 (5.1)!	65 (7.9)!	80 (4.6)!
	Extreme rural	*** (**.*)	*** (**.*)	*** (**.*)
	Other	36 (3.6)	31 (4.0)	41 (3.6)
Nation				
	Advantaged urban	18 (3.2)!	22 (4.3)!	21 (3.7)!
	Disadvantaged urban	73 (3.3)	57 (4.2)!	72 (3.2)
	Extreme rural	40 (5.2)	50 (5.7)!	35 (6.2)!
	Other	39 (1.4)	42 (2.0)	37 (1.6)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

PARENTS' EDUCATION LEVEL

Previous NAEP findings have shown that students whose parents are better educated tend to have higher mathematics proficiency. Table 10A (average proficiency) and Table 10B (percentile distribution) show the mathematics proficiency results for fourth-grade public-school students who reported that at least one parent graduated from college, at least one parent had some education after high school, at least one parent graduated from high school, neither parent graduated from high school, and they did not know their parents' education level; and for eighth-grade public-school students who reported that at least one parent graduated from college, at least one parent had some education after high school, at least one parent graduated from high school, neither parent graduated from high school, and they did not know their parents' education level. (These are the groups with student samples large enough to be reliably reported.) In Pennsylvania:

Grade 4 1992

Students who reported that at least one parent graduated from college demonstrated about the same average mathematics proficiency as did students who reported that at least one parent had some education after high school but higher mathematics proficiency than did students who reported that at least one parent graduated from high school, neither parent graduated from high school, or they did not know their parents' education level.

Grade 8
1992

Students who reported that at least one parent graduated from college demonstrated higher mathematics proficiency than did students who reported that at least one parent had some education after high school, at least one parent graduated from high school, neither parent graduated from high school, or they did not know their parents' education level.

Grade 8
1990 vs 1992

Students who reported that at least one parent graduated from college, at least one parent had some education after high school, at least one parent graduated from high school, neither parent graduated from high school, or they did not know their parents' education level performed about the same in 1992 as in 1990.

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TABLE 10A

Average Fourth-Grade and Eighth-Grade Public-School Mathematics Proficiency by Parents' Education

		Grade 4	Grade 8	
		1992	1990	1992
		Proficiency	**Proficiency**	**Proficiency**
Pennsylvania				
	Graduated college	230 (2.0)	281 (2.0)	282 (1.6)
	Some education after high school	236 (2.0)	271 (1.6)	274 (1.9)
	Graduated high school	220 (1.6)	256 (1.7)	262 (1.6)
	Did not finish high school	211 (3.3)	247 (3.1)	252 (2.8)
	I don't know	215 (1.8)	243 (4.2)	252 (3.8)
Northeast				
	Graduated college	231 (3.0)	282 (3.5)	282 (4.2)
	Some education after high school	229 (4.7)	267 (3.5)	267 (3.0)
	Graduated high school	215 (5.2)	260 (2.6)	259 (4.2)
	Did not finish high school	*** (**.*)	*** (**.*)	246 (4.2)
	I don't know	216 (2.4)	*** (**.*)	250 (3.3)
Nation				
	Graduated college	225 (1.2)	274 (1.6)	279 (1.4)
	Some education after high school	223 (1.7)	267 (1.6)	270 (1.2)
	Graduated high school	212 (1.6)	255 (1.5)	256 (1.4)
	Did not finish high school	203 (2.7)	241 (2.0)	248 (1.8)
	I don't know	212 (0.9)	240 (3.3)	251 (1.7) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE 10B | Percentiles of Mathematics Proficiency in Fourth- and Eighth-Grade Public Schools by Parents' Education

	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
GRADE 4 1992							
College graduate							
Pennsylvania	172 (6.9)	189 (3.7)	210 (2.5)	233 (2.4)	252 (1.7)	267 (2.1)	276 (2.4)
Northeast	169 (6.4)	184 (3.7)	209 (4.9)	234 (4.7)	256 (4.1)	272 (3.6)	282 (3.6)
Nation	164 (3.2)	179 (2.8)	203 (1.4)	227 (1.8)	248 (1.4)	266 (1.8)	276 (2.3)
Some college							
Pennsylvania	183 (5.2)	194 (5.1)	217 (2.4)	239 (4.4)	256 (2.0)	273 (5.0)	282 (3.1)
Northeast	159 (15.6)	183 (14.6)	209 (12.7)	235 (4.5)	251 (4.5)	268 (5.2)	284 (20.1)
Nation	163 (4.2)	179 (1.5)	202 (4.7)	227 (1.7)	245 (2.4)	259 (3.2)	268 (4.7)
High school graduate							
Pennsylvania	170 (4.3)	182 (5.2)	203 (3.2)	222 (1.2)	239 (2.4)	256 (3.8)	264 (3.1)
Northeast	166 (8.6)	175 (5.6)	195 (3.9)	216 (5.6)	233 (5.8)	253 (7.2)	268 (14.0)
Nation	159 (2.3)	172 (3.4)	191 (2.1)	214 (2.0)	233 (1.7)	251 (3.2)	262 (4.1)
High school non-graduate							
Pennsylvania	166 (13.5)	175 (7.5)	193 (3.2)	213 (5.3)	232 (3.5)	245 (3.1)	255 (6.3)
Northeast	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	154 (5.5)	164 (5.0)	183 (3.2)	204 (5.7)	223 (4.1)	241 (6.2)	249 (14.8)
I don't know							
Pennsylvania	165 (2.5)	176 (1.6)	194 (1.9)	216 (2.2)	237 (2.0)	254 (2.0)	264 (4.8)
Northeast	163 (4.6)	175 (1.4)	195 (3.0)	216 (3.6)	238 (4.0)	256 (3.8)	265 (7.1)
Nation	159 (2.6)	171 (1.5)	191 (1.6)	213 (1.5)	234 (1.5)	252 (1.8)	261 (0.9)
GRADE 8 1990							
College graduate							
Pennsylvania	223 (5.2)	237 (3.0)	258 (2.4)	283 (1.9)	304 (2.4)	322 (2.4)	333 (3.1)
Northeast	225 (9.7)	239 (7.9)	263 (4.9)	284 (3.8)	304 (3.3)	321 (5.6)	332 (2.6)
Nation	211 (6.2)	226 (2.4)	252 (1.2)	277 (1.5)	299 (1.8)	318 (2.8)	329 (1.7)
Some college							
Pennsylvania	221 (5.2)	235 (2.5)	252 (1.6)	272 (1.3)	291 (2.9)	305 (2.8)	315 (2.7)
Northeast	204 (9.5)	220 (11.2)	246 (3.6)	269 (3.3)	289 (5.2)	307 (3.7)	316 (16.4)
Nation	208 (5.9)	222 (6.4)	245 (1.9)	268 (1.9)	289 (2.2)	305 (1.4)	320 (4.9)
High school graduate							
Pennsylvania	204 (3.9)	215 (2.8)	235 (2.1)	257 (1.9)	279 (1.9)	295 (2.8)	305 (2.9)
Northeast	213 (9.1)	224 (3.5)	242 (5.1)	258 (2.4)	280 (2.4)	300 (2.0)	306 (2.7)
Nation	200 (3.1)	212 (3.4)	233 (2.2)	255 (1.3)	277 (3.6)	297 (1.5)	306 (1.8)
High school non-graduate							
Pennsylvania	190 (6.4)	203 (14.3)	229 (3.2)	251 (4.7)	269 (2.2)	283 (11.5)	293 (6.3)
Northeast	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	192 (9.2)	204 (4.7)	223 (1.9)	242 (4.0)	261 (3.9)	277 (3.0)	290 (4.5)
I don't know							
Pennsylvania	182 (18.6)	196 (15.0)	217 (8.1)	245 (8.3)	268 (4.1)	289 (5.7)	304 (11.1)
Northeast	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	182 (9.5)	191 (6.6)	215 (4.2)	240 (3.2)	265 (4.0)	287 (10.0)	298 (14.1)

(continued on next page)

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TABLE 10B (continued)

Percentiles of Mathematics Proficiency in Fourth- and Eighth-Grade Public Schools by Parents' Education

	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
GRADE 8 1992							
College graduate							
Pennsylvania	221 (3.4)	236 (2.6)	260 (1.9)	285 (2.0)	306 (2.5)	324 (2.4)	332 (2.5)
Northeast	212 (9.0)	227 (7.1)	252 (7.5)	287 (2.8)	313 (3.6)	332 (1.9)	340 (4.0)
Nation	215 (2.1)	230 (2.4)	254 (2.7)	281 (2.3)	305 (2.4)	324 (1.5)	334 (1.7)
Some college							
Pennsylvania	220 (2.6)	233 (3.1)	254 (1.7)	275 (1.9)	294 (2.2)	312 (4.4)	326 (6.4)
Northeast	204 (12.8)	221 (12.3)	246 (3.7)	266 (3.8)	290 (1.8)	311 (3.5)	328 (5.1)
Nation	213 (3.6)	226 (2.0)	248 (1.8)	269 (2.4)	293 (1.4)	314 (1.7) >	325 (2.6)
High school graduate							
Pennsylvania	208 (3.3)	220 (3.4)	240 (2.2)	263 (2.1)	284 (4.8)	303 (1.4)	314 (4.7)
Northeast	202 (12.2)	217 (5.3)	236 (5.3)	258 (6.7)	284 (5.2)	300 (1.2)	312 (4.0)
Nation	200 (5.2)	212 (2.6)	233 (1.2)	257 (1.5)	280 (1.7)	298 (2.0)	310 (2.3)
High school non-graduate							
Pennsylvania	202 (6.4)	213 (3.3)	230 (7.9)	252 (2.4)	273 (1.5)	293 (3.9)	302 (13.6)
Northeast	199 (6.3)	206 (9.2)	225 (3.7)	243 (2.3)	265 (11.8)	291 (19.4)	305 (5.1)
Nation	199 (2.3)	208 (2.4)	226 (1.5)	245 (3.6)	270 (2.2)	291 (3.3)	302 (5.1)
I don't know							
Pennsylvania	193 (11.3)	211 (8.9)	232 (3.3)	251 (4.2)	275 (9.5)	295 (8.6)	309 (11.2)
Northeast	199 (2.5)	206 (3.2)	228 (3.6)	249 (4.8)	271 (7.0)	292 (12.9)	309 (15.4)
Nation	193 (3.0)	206 (3.6)	227 (2.8)	249 (3.3)	274 (4.1)	296 (3.1)	307 (5.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

Table 11 presents mathematics proficiency by achievement levels. In Pennsylvania:

Grade 4 1992

Achievement was at or above the Proficient level for 30 percent of the students who reported that at least one parent graduated from college, 38 percent of the students who reported that at least one parent had some education after high school, 17 percent of the students who reported that at least one parent graduated from high school, 8 percent of the students who reported that neither parent graduated from high school, and 14 percent of the students who reported that they did not know their parents' education level.

Grade 8 1992

Achievement was at or above the Proficient level for 39 percent of the students who reported that at least one parent graduated from college, 25 percent of the students who reported that at least one parent had some education after high school, 16 percent of the students who reported that at least one parent graduated from high school, 9 percent of the students who reported that neither parent graduated from high school, and 10 percent of the students who reported that they did not know their parents' education level.

Grade 8 1990 vs 1992

About the same percentage of students who reported that at least one parent graduated from college, at least one parent had some education after high school, at least one parent graduated from high school, neither parent graduated from high school, or they did not know their parents' education level were at or above the Proficient level in 1992 as in 1990.

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TABLE 11

Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Achievement by Parents' Education

		Grade 4	Grade 8	
		1992	1990	1992
		Percentage	Percentage	Percentage
At or Above Advanced Level				
Pennsylvania				
	Graduated college	4 (1.1)	6 (0.9)	5 (1.2)
	Some education after high school	5 (1.9)	1 (0.7)	3 (1.4)
	Graduated high school	1 (0.9)	0 (0.2)	2 (0.5)
	Did not finish high school	0 (0.4)	0 (0.0)	0 (0.3)
	I don't know	2 (0.5)	0 (0.0)	1 (1.2)
Northeast				
	Graduated college	6 (1.8)	5 (1.6)	10 (2.7)
	Some education after high school	6 (2.7)	2 (2.4)	5 (2.1)
	Graduated high school	1 (1.3)	1 (0.7)	1 (1.4)
	Did not finish high school	*** (**.*)	*** (**.*)	0 (0.5)
	I don't know	1 (0.7)	*** (**.*)	1 (2.3)
Nation				
	Graduated college	4 (0.7)	4 (0.9)	6 (1.0)
	Some education after high school	2 (0.7)	3 (0.8)	3 (0.7)
	Graduated high school	1 (0.5)	0 (0.4)	1 (0.4)
	Did not finish high school	0 (0.3)	0 (0.1)	1 (0.5)
	I don't know	1 (0.3)	0 (0.2)	1 (0.6)
At or Above Proficient Level				
Pennsylvania				
	Graduated college	30 (2.4)	37 (2.5)	39 (2.1)
	Some education after high school	38 (4.4)	21 (2.2)	25 (2.3)
	Graduated high school	17 (2.3)	11 (1.6)	16 (1.6)
	Did not finish high school	8 (3.0)	4 (2.1)	9 (2.4)
	I don't know	14 (1.6)	8 (2.5)	10 (3.1)
Northeast				
	Graduated college	33 (4.8)	38 (4.2)	43 (5.4)
	Some education after high school	29 (4.7)	21 (7.3)	21 (4.2)
	Graduated high school	12 (4.5)	14 (2.9)	14 (3.7)
	Did not finish high school	*** (**.*)	*** (**.*)	9 (4.7)
	I don't know	15 (2.5)	*** (**.*)	9 (3.7)
Nation				
	Graduated college	25 (2.0)	30 (2.0)	36 (1.9)
	Some education after high school	21 (2.5)	20 (2.6)	24 (1.5)
	Graduated high school	12 (1.8)	12 (1.4)	13 (1.3)
	Did not finish high school	5 (1.9)	4 (1.4)	8 (1.8)
	I don't know	12 (1.1)	7 (2.1)	11 (1.9)
At or Above Basic Level				
Pennsylvania				
	Graduated college	75 (2.5)	77 (2.4)	78 (1.7)
	Some education after high school	80 (2.7)	71 (2.7)	73 (2.8)
	Graduated high school	66 (2.8)	51 (2.4)	59 (2.1)
	Did not finish high school	54 (7.3)	42 (4.9)	44 (4.6)
	I don't know	56 (2.7)	40 (6.0)	44 (5.2)
Northeast				
	Graduated college	73 (3.5)	81 (3.8)	73 (3.9)
	Some education after high school	74 (7.7)	64 (4.6)	62 (6.0)
	Graduated high school	57 (8.5)	54 (6.4)	52 (7.2)
	Did not finish high school	*** (**.*)	*** (**.*)	35 (5.8)
	I don't know	56 (3.3)	*** (**.*)	41 (6.5)
Nation				
	Graduated college	68 (1.4)	71 (1.8)	74 (1.4)
	Some education after high school	68 (3.3)	64 (2.2)	67 (1.9)
	Graduated high school	54 (2.8)	49 (2.1)	51 (2.2)
	Did not finish high school	40 (5.2)	32 (3.8)	39 (3.3)
	I don't know	52 (1.5)	34 (3.7)	43 (2.5)

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TABLE 11
(continued)

Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Achievement by Parents' Education

		Grade 4	Grade 8	
		1992	1990	1992
		Percentage	**Percentage**	**Percentage**
Below Basic Level				
Pennsylvania				
	Graduated college	25 (2.5)	23 (2.4)	22 (1.7)
	Some education after high school	20 (2.7)	29 (2.7)	27 (2.8)
	Graduated high school	34 (2.8)	49 (2.4)	41 (2.1)
	Did not finish high school	46 (7.3)	58 (4.9)	56 (4.6)
	I don't know	44 (2.7)	60 (6.0)	56 (5.2)
Northeast				
	Graduated college	27 (3.5)	19 (3.8)	27 (3.9)
	Some education after high school	26 (7.7)	36 (4.6)	38 (6.0)
	Graduated high school	43 (8.5)	47 (6.4)	48 (7.2)
	Did not finish high school	*** (**.*)	*** (**.*)	65 (5.8)
	I don't know	44 (3.3)	*** (**.*)	59 (6.5)
Nation				
	Graduated college	32 (1.4)	29 (1.8)	26 (1.4)
	Some education after high school	32 (3.3)	36 (2.2)	33 (1.9)
	Graduated high school	46 (2.8)	51 (2.1)	49 (2.2)
	Did not finish high school	60 (5.2)	68 (3.8)	61 (3.3)
	I don't know	48 (1.5)	66 (3.7)	57 (2.5)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

GENDER

Table 12A (average proficiency) and Table 12B (percentile distribution) provide the mathematics proficiency results by gender.

- In Pennsylvania, there appears to be no significant difference in the average proficiency of fourth-grade males and females; however, in grade 8, females had a lower average proficiency than did males.
- In Pennsylvania, the average mathematics proficiency for eighth-grade females in 1992 was about the same as the average mathematics proficiency for eighth-grade females in 1990. The average mathematics proficiency for eighth-grade males in 1992 was about the same as the average mathematics proficiency for eighth-grade males in 1990.

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TABLE 12A

Average Fourth-Grade and Eighth-Grade Public-School Mathematics Proficiency by Gender

	Grade 4	Grade 8	
	1992	1990	1992
	Proficiency	Proficiency	Proficiency
Pennsylvania			
Male	224 (1.6)	269 (1.7)	273 (1.6)
Female	222 (1.6)	263 (1.8)	268 (1.7)
Northeast			
Male	225 (2.3)	271 (4.1)	267 (2.9)
Female	220 (2.9)	269 (3.2)	267 (3.6)
Nation			
Male	218 (0.9)	262 (1.7)	266 (1.2)
Female	216 (1.1)	261 (1.4)	267 (1.2) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

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TABLE 12B

Percentiles of Mathematics Proficiency in Fourth- and Eighth-Grade Public Schools by Gender

	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
GRADE 4 1992							
Male							
Pennsylvania	170 (5.2)	182 (3.0)	203 (2.2)	225 (1.6)	247 (1.5)	263 (1.9)	273 (2.7)
Northeast	165 (5.5)	180 (6.3)	202 (2.2)	228 (2.4)	250 (4.4)	268 (4.1)	278 (3.0)
Nation	160 (2.2)	173 (1.5)	196 (0.7)	220 (1.3)	242 (1.2)	260 (1.5)	271 (1.8)
Female							
Pennsylvania	167 (1.6)	180 (2.7)	202 (2.0)	224 (1.4)	244 (2.3)	261 (1.8)	271 (1.7)
Northeast	164 (3.2)	175 (2.6)	199 (5.4)	222 (5.2)	243 (3.5)	261 (3.3)	271 (5.5)
Nation	162 (1.0)	174 (1.3)	195 (2.7)	218 (1.5)	238 (1.7)	256 (1.2)	266 (1.0)
GRADE 8 1990							
Male							
Pennsylvania	210 (3.1)	224 (1.9)	246 (1.9)	270 (2.4)	293 (1.8)	313 (1.5)	324 (2.0)
Northeast	215 (8.5)	231 (2.2)	247 (2.6)	270 (7.9)	297 (13.1)	314 (4.9)	324 (6.0)
Nation	199 (3.4)	213 (2.6)	237 (2.2)	263 (1.3)	289 (2.1)	310 (2.0)	322 (2.6)
Female							
Pennsylvania	206 (4.9)	219 (3.6)	242 (3.1)	265 (2.2)	287 (1.6)	304 (2.6)	316 (1.5)
Northeast	207 (4.7)	221 (5.0)	247 (5.5)	272 (2.8)	293 (2.8)	308 (2.7)	321 (15.0)
Nation	201 (1.7)	215 (3.5)	237 (2.2)	263 (1.4)	286 (1.4)	304 (1.6)	316 (3.2)
GRADE 8 1992							
Male							
Pennsylvania	214 (3.2)	227 (3.2)	250 (2.4)	275 (1.7)	297 (1.3)	317 (2.3)	328 (2.6)
Northeast	205 (2.2)	217 (5.0)	239 (4.6)	265 (4.5)	295 (4.5)	318 (4.4)	333 (3.0)
Nation	204 (2.6)	217 (1.7)	240 (2.1)	266 (1.4)	283 (0.9)	313 (2.0)	325 (1.8)
Female							
Pennsylvania	210 (2.8)	223 (2.5)	245 (2.6)	269 (2.3)	292 (2.1)	312 (3.2)	324 (1.7) >
Northeast	205 (9.9)	218 (4.2)	241 (2.3)	266 (5.1)	294 (6.1)	319 (4.5)	330 (4.1)
Nation	206 (1.3)	219 (1.8)	241 (1.3)	267 (1.4)	292 (1.3)	314 (1.7) >	325 (2.3)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

Table 13 presents mathematics performance by achievement levels.

- There was no significant difference between the percentages of fourth-grade males and females in Pennsylvania who were at or above the Proficient level (21 percent for females and 24 percent for males). In addition, there was a difference between the percentages of eighth-grade males and females in Pennsylvania who were at or above the Proficient level (23 percent for females and 29 percent for males).
- Also in Pennsylvania, about the same percentage of eighth-grade males were at or above the Proficient level in 1992 as in 1990. About the same percentage of eighth-grade females were at or above the Proficient level in 1992 as in 1990.

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TABLE 13

Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Achievement by Gender

		Grade 4	Grade 8	
		1992	1990	1992
		Percentage	Percentage	Percentage
At or Above Advanced Level				
Pennsylvania				
	Male	3 (0.6)	3 (0.6)	4 (0.9)
	Female	2 (0.7)	2 (0.4)	3 (0.6)
Northeast				
	Male	4 (1.1)	4 (0.8)	6 (1.3)
	Female	2 (1.1)	3 (1.5)	5 (2.2)
Nation				
	Male	3 (0.5)	3 (0.5)	3 (0.6)
	Female	2 (0.3)	2 (0.5)	3 (0.6)
At or Above Proficient Level				
Pennsylvania				
	Male	24 (2.0)	25 (1.8)	29 (1.6)
	Female	21 (1.5)	18 (1.7)	23 (2.0)
Northeast				
	Male	27 (3.3)	27 (4.1)	26 (3.0)
	Female	20 (3.4)	24 (3.8)	25 (3.6)
Nation				
	Male	19 (1.1)	21 (1.6)	24 (1.3)
	Female	16 (1.4)	18 (1.3)	23 (1.4) >
At or Above Basic Level				
Pennsylvania				
	Male	67 (2.4)	66 (2.2)	70 (1.9)
	Female	66 (2.1)	60 (2.5)	65 (2.1)
Northeast				
	Male	66 (2.7)	64 (4.8)	59 (4.3)
	Female	62 (4.5)	67 (3.7)	60 (4.1)
Nation				
	Male	60 (1.2)	57 (1.9)	61 (1.4)
	Female	58 (1.7)	57 (1.6)	61 (1.3)
Below Basic Level				
Pennsylvania				
	Male	33 (2.4)	34 (2.2)	30 (1.9)
	Female	34 (2.1)	40 (2.5)	35 (2.1)
Northeast				
	Male	34 (2.7)	36 (4.8)	41 (4.3)
	Female	38 (4.5)	33 (3.7)	40 (4.1)
Nation				
	Male	40 (1.2)	43 (1.9)	39 (1.4)
	Female	42 (1.7)	43 (1.6)	39 (1.3)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

CONTENT AREA PERFORMANCE

Tables 14A-14F provide a summary of content area performance by race/ethnicity, type of community, parents' education level, and gender.

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TABLE 14A

Fourth- and Eighth-Grade Public-School Performance in Numbers and Operations by Subpopulation

		Grade 4	Grade 8	
		1992	1990	1992
		Proficiency	**Proficiency**	**Proficiency**
TOTAL				
	Pennsylvania	221 (1.6)	270 (1.7)	274 (1.6)
	Northeast	220 (2.2)	272 (2.9)	271 (2.7)
	Nation	214 (0.9)	266 (1.3)	270 (0.9) >
RACE/ETHNICITY				
White	Pennsylvania	228 (1.4)	275 (1.3)	279 (1.3)
	Northeast	230 (2.5)	276 (2.3)	281 (3.0)
	Nation	223 (1.1)	273 (1.4)	279 (1.0) >
Black	Pennsylvania	190 (3.2)	247 (3.8)	243 (4.1)
	Northeast	191 (3.7)	252 (6.9)!	246 (3.8)
	Nation	188 (1.4)	245 (2.9)	243 (1.3)
Hispanic	Pennsylvania	200 (2.9)	238 (4.7)	249 (3.7)!
	Northeast	196 (3.8)	*** (**.*)	246 (3.9)!
	Nation	196 (2.0)	248 (2.7)	249 (1.6)
TYPE OF COMMUNITY				
Advantaged urban	Pennsylvania	236 (5.2)!	290 (2.4)!	290 (4.0)!
	Northeast	241 (3.0)!	283 (7.9)!	292 (5.8)!
	Nation	239 (3.0)!	284 (3.9)!	286 (4.1)!
Disadvantaged urban	Pennsylvania	194 (4.5)	251 (4.7)!	250 (4.5)!
	Northeast	204 (4.0)!	251 (10.7)!	240 (3.7)!
	Nation	191 (2.9)	255 (3.4)!	244 (2.6)
Extreme rural	Pennsylvania	227 (1.9)!	271 (2.8)!	279 (3.6)!
	Northeast	*** (**.*)	*** (**.*)	*** (**.*)
	Nation	213 (3.6)	260 (4.5)!	271 (3.9)!
Other	Pennsylvania	224 (1.7)	271 (1.6)	278 (1.3) >
	Northeast	218 (2.7)	274 (3.4)	271 (2.6)
	Nation	215 (1.1)	266 (1.7)	271 (1.1)
PARENTS' EDUCATION				
Graduated college	Pennsylvania	228 (2.2)	284 (2.1)	283 (1.9)
	Northeast	230 (3.1)	285 (3.0)	284 (3.8)
	Nation	223 (1.4)	278 (1.5)	281 (1.3)
Some education after high school	Pennsylvania	234 (2.6)	273 (1.9)	278 (1.9)
	Northeast	227 (5.0)	270 (3.6)	271 (3.1)
	Nation	220 (2.1)	271 (1.5)	273 (1.1)
Graduated high school	Pennsylvania	219 (1.9)	261 (1.6)	266 (1.7)
	Northeast	211 (5.1)	262 (2.8)	263 (4.0)
	Nation	209 (1.9)	259 (1.6)	261 (1.4)
Did not finish high school	Pennsylvania	209 (3.7)	253 (3.0)	256 (2.7)
	Northeast	*** (**.*)	*** (**.*)	252 (4.1)
	Nation	199 (2.8)	247 (2.1)	253 (1.8)
I don't know	Pennsylvania	212 (2.0)	246 (4.2)	255 (3.8)
	Northeast	212 (2.8)	*** (**.*)	254 (3.8)
	Nation	208 (1.1)	243 (3.4)	254 (1.7)
GENDER				
Male	Pennsylvania	222 (1.9)	272 (1.8)	276 (1.8)
	Northeast	223 (2.4)	273 (3.7)	270 (2.7)
	Nation	216 (1.0)	266 (1.6)	269 (1.1)
Female	Pennsylvania	220 (1.8)	268 (1.9)	271 (1.7)
	Northeast	217 (3.0)	272 (2.8)	272 (3.2)
	Nation	213 (1.3)	266 (1.4)	271 (1.1) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE 14B

Fourth- and Eighth-Grade Public-School Performance in Measurement by Subpopulation

			Grade 4	Grade 8	
			1992	1990	1992
			Proficiency	Proficiency	Proficiency
TOTAL		Pennsylvania	229 (1.6)	264 (2.0)	271 (2.0)
		Northeast	227 (2.3)	267 (4.2)	265 (3.9)
		Nation	222 (0.9)	258 (1.6)	264 (1.3) >
RACE/ETHNICITY					
	White	Pennsylvania	236 (1.4)	271 (1.4)	277 (1.7)
		Northeast	237 (2.6)	272 (3.6)	279 (4.1)
		Nation	232 (1.1)	267 (1.8)	276 (1.5) >
	Black	Pennsylvania	194 (2.9)	233 (4.0)	232 (5.1)
		Northeast	196 (3.0)	236 (8.0)!	229 (5.5)
		Nation	193 (1.7)	227 (3.3)	225 (1.9)
	Hispanic	Pennsylvania	207 (2.8)	219 (7.4)	248 (5.9)! >
		Northeast	204 (3.5)	*** (**.*)	235 (4.8)!
		Nation	202 (1.6)	237 (3.2)	241 (1.9)
TYPE OF COMMUNITY					
	Advantaged urban	Pennsylvania	243 (5.0)!	290 (3.2)!	293 (8.1)!
		Northeast	249 (4.4)!	279 (9.7)!	295 (7.8)!
		Nation	246 (3.5)!	281 (4.8)!	287 (6.0)!
	Disadvantaged urban	Pennsylvania	196 (4.0)	238 (6.9)!	240 (6.2)!
		Northeast	208 (4.2)!	237 (16.4)!	225 (1.7)!
		Nation	194 (3.6)	243 (4.8)!	229 (3.5)
	Extreme rural	Pennsylvania	238 (2.1)!	268 (4.6)!	279 (6.3)!
		Northeast	*** (**.*)	*** (**.*)	*** (**.*)
		Nation	222 (4.1)	253 (4.8)!	265 (5.5)!
	Other	Pennsylvania	232 (1.8)	266 (1.9)	276 (2.0) >
		Northeast	224 (2.5)	269 (5.1)	264 (3.9)
		Nation	224 (1.0)	258 (2.2)	266 (1.6) >
PARENTS' EDUCATION					
	Graduated college	Pennsylvania	235 (2.4)	281 (2.6)	286 (1.9)
		Northeast	234 (3.4)	280 (5.0)	283 (5.4)
		Nation	229 (1.4)	272 (2.0)	279 (2.3)
	Some education after high school	Pennsylvania	243 (3.0)	268 (2.7)	273 (2.4)
		Northeast	235 (4.9)	262 (4.5)	264 (3.4)
		Nation	228 (1.9)	264 (2.1)	267 (1.5)
	Graduated high school	Pennsylvania	227 (2.0)	252 (2.3)	261 (2.5)
		Northeast	221 (5.6)	257 (3.1)	254 (5.5)
		Nation	218 (1.7)	249 (1.9)	251 (1.8)
	Did not finish high school	Pennsylvania	217 (3.4)	242 (4.6)	249 (3.7)
		Northeast	*** (**.*)	*** (**.*)	238 (5.6)
		Nation	207 (3.3)	236 (2.7)	243 (2.6)
	I don't know	Pennsylvania	220 (2.1)	243 (7.7)	248 (6.1)
		Northeast	220 (2.2)	*** (**.*)	246 (4.5)
		Nation	217 (0.9)	234 (3.8)	248 (2.2) >
GENDER					
	Male	Pennsylvania	231 (2.0)	271 (2.4)	276 (2.0)
		Northeast	230 (2.7)	271 (5.5)	267 (3.5)
		Nation	224 (1.1)	262 (2.1)	266 (1.4)
	Female	Pennsylvania	226 (1.8)	258 (2.1)	266 (2.4)
		Northeast	224 (2.8)	262 (4.0)	262 (4.8)
		Nation	221 (1.2)	254 (1.6)	262 (1.7) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE 14C

Fourth- and Eighth-Grade Public-School Performance in Geometry by Subpopulation

		Grade 4	Grade 8	
		1992	1990	1992
		Proficiency	Proficiency	Proficiency
TOTAL				
	Pennsylvania	223 (1.2)	263 (1.7)	265 (1.5)
	Northeast	224 (2.2)	268 (3.3)	263 (3.1)
	Nation	220 (0.7)	259 (1.4)	262 (1.0)
RACE/ETHNICITY				
White	Pennsylvania	229 (1.2)	269 (1.3)	270 (1.2)
	Northeast	232 (2.5)	272 (2.5)	273 (3.4)
	Nation	228 (0.9)	267 (1.5)	271 (1.2)
Black	Pennsylvania	199 (2.4)	233 (3.3)	233 (4.7)
	Northeast	199 (2.9)	244 (9.1)!	236 (4.1)
	Nation	195 (1.5)	235 (3.2)	233 (1.7)
Hispanic	Pennsylvania	208 (2.6)	230 (4.9)	241 (4.1)!
	Northeast	204 (3.3)	*** (**.*)	241 (3.7)!
	Nation	205 (1.4)	242 (2.7)	245 (1.4)
TYPE OF COMMUNITY				
Advantaged urban	Pennsylvania	235 (3.4)!	284 (3.8)!	281 (9.5)!
	Northeast	241 (3.2)!	276 (9.5)!	286 (6.1)!
	Nation	238 (3.1)!	278 (4.7)!	280 (3.8)!
Disadvantaged urban	Pennsylvania	201 (3.2)	241 (5.7)!	239 (4.9)!
	Northeast	207 (2.8)!	241 (10.9)!	233 (3.4)!
	Nation	196 (2.9)	249 (3.7)!	237 (2.7)
Extreme rural	Pennsylvania	228 (1.6)!	266 (4.0)!	272 (4.1)!
	Northeast	*** (**.*)	*** (**.*)	*** (**.*)
	Nation	219 (3.2)	255 (4.3)!	261 (5.2)!
Other	Pennsylvania	226 (1.5)	264 (1.6)	269 (1.3)
	Northeast	223 (2.5)	271 (3.4)	262 (3.2)
	Nation	222 (1.0)	259 (1.7)	263 (1.2)
PARENTS' EDUCATION				
Graduated college	Pennsylvania	229 (1.9)	276 (2.3)	274 (1.8)
	Northeast	230 (3.0)	278 (3.3)	276 (4.2)
	Nation	225 (1.0)	271 (1.7)	272 (1.4)
Some education after high school	Pennsylvania	234 (1.9)	268 (1.9)	267 (2.1)
	Northeast	228 (5.3)	265 (3.7)	262 (3.0)
	Nation	223 (2.0)	262 (1.9)	264 (1.4)
Graduated high school	Pennsylvania	217 (2.7)	254 (1.8)	258 (2.2)
	Northeast	217 (5.8)	259 (2.8)	257 (4.1)
	Nation	215 (1.6)	253 (1.5)	254 (1.4)
Did not finish high school	Pennsylvania	213 (3.7)	246 (3.0)	248 (3.0)
	Northeast	*** (**.*)	*** (**.*)	243 (4.1)
	Nation	208 (2.5)	241 (2.1)	246 (1.4)
I don't know	Pennsylvania	219 (2.0)	241 (4.7)	251 (4.2)
	Northeast	220 (2.2)	*** (**.*)	245 (2.6)
	Nation	217 (1.0)	243 (3.3)	248 (1.7)
GENDER				
Male	Pennsylvania	224 (1.5)	266 (1.9)	267 (1.6)
	Northeast	226 (2.1)	269 (4.5)	263 (3.0)
	Nation	221 (0.8)	260 (1.7)	262 (1.2)
Female	Pennsylvania	223 (1.3)	260 (1.9)	263 (1.6)
	Northeast	222 (3.1)	267 (3.3)	262 (3.7)
	Nation	219 (1.0)	258 (1.4)	262 (1.2)

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TABLE 14D

Fourth- and Eighth-Grade Public-School Performance in Data Analysis, Statistics, and Probability by Subpopulation

		Grade 4	Grade 8	
		1992	1990	1992
		Proficiency	**Proficiency**	**Proficiency**
TOTAL				
	Pennsylvania	223 (1.5)	268 (1.9)	273 (1.8)
	Northeast	223 (2.3)	273 (3.9)	269 (3.5)
	Nation	218 (1.0)	262 (1.6)	267 (1.2)
RACE/ETHNICITY				
White	Pennsylvania	230 (1.5)	274 (1.3)	279 (1.4)
	Northeast	232 (2.5)	279 (3.0)	282 (3.9)
	Nation	227 (1.3)	272 (1.7)	278 (1.3) >
Black	Pennsylvania	192 (2.7)	237 (3.6)	234 (6.3)
	Northeast	193 (3.0)	244 (9.8)!	238 (4.2)
	Nation	191 (1.6)	232 (3.2)	234 (1.7)
Hispanic	Pennsylvania	200 (3.8)	225 (5.0)	246 (7.3)!
	Northeast	201 (3.5)	*** (**.*)	238 (4.4)!
	Nation	201 (1.4)	239 (3.2)	241 (1.7)
TYPE OF COMMUNITY				
Advantaged urban	Pennsylvania	239 (4.7)!	292 (2.9)!	294 (8.4)!
	Northeast	242 (3.9)!	284 (9.3)!	297 (8.2)!
	Nation	241 (3.2)!	285 (4.2)!	287 (5.6)!
Disadvantaged urban	Pennsylvania	194 (4.2)	245 (6.3)!	246 (7.0)!
	Northeast	206 (3.7)!	241 (15.0)!	232 (3.3)!
	Nation	194 (3.0)	247 (4.7)!	236 (3.4)
Extreme rural	Pennsylvania	231 (2.0)!	269 (3.4)!	278 (4.9)!
	Northeast	*** (**.*)	*** (**.*)	*** (**.*)
	Nation	217 (3.9)	257 (5.5)!	269 (5.9)!
Other	Pennsylvania	226 (1.6)	268 (1.7)	277 (1.8) >
	Northeast	220 (2.9)	277 (4.1)	268 (3.4)
	Nation	219 (1.3)	262 (2.3)	268 (1.4)
PARENTS' EDUCATION				
Graduated college	Pennsylvania	230 (2.1)	284 (2.4)	285 (2.0)
	Northeast	230 (3.3)	287 (4.0)	285 (4.7)
	Nation	224 (1.4)	276 (1.9)	281 (1.8)
Some education after high school	Pennsylvania	238 (2.3)	272 (2.4)	274 (2.7)
	Northeast	232 (5.3)	272 (3.4)	270 (3.8)
	Nation	225 (1.9)	269 (2.0)	273 (1.6)
Graduated high school	Pennsylvania	219 (1.9)	256 (1.6)	263 (1.9)
	Northeast	215 (5.9)	262 (3.2)	258 (4.8)
	Nation	214 (2.0)	254 (2.0)	254 (1.8)
Did not finish high school	Pennsylvania	212 (3.2)	245 (3.7)	251 (3.7)
	Northeast	*** (**.*)	*** (**.*)	245 (5.5)
	Nation	204 (2.1)	238 (2.3)	246 (2.5)
I don't know	Pennsylvania	216 (1.9)	243 (4.9)	253 (4.6)
	Northeast	216 (2.7)	*** (**.*)	249 (4.4)
	Nation	213 (1.1)	236 (4.0)	248 (2.2)
GENDER				
Male	Pennsylvania	224 (1.9)	271 (2.1)	275 (2.0)
	Northeast	224 (2.7)	274 (4.6)	268 (3.5)
	Nation	219 (1.1)	263 (2.0)	266 (1.4)
Female	Pennsylvania	222 (1.9)	264 (2.0)	270 (2.2)
	Northeast	221 (2.7)	273 (3.7)	269 (4.0)
	Nation	218 (1.3)	262 (1.7)	267 (1.3)

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TABLE 14E

Fourth- and Eighth-Grade Public-School Performance in Algebra and Functions by Subpopulation

		Grade 4	Grade 8	
		1992	1990	1992
		Proficiency	Proficiency	Proficiency
TOTAL				
	Pennsylvania	221 (1.4)	265 (1.6)	270 (1.5)
	Northeast	222 (2.2)	268 (3.3)	266 (2.8)
	Nation	216 (0.9)	260 (1.3)	266 (1.1) >
RACE/ETHNICITY				
White	Pennsylvania	229 (1.3)	271 (1.2)	275 (1.2)
	Northeast	232 (2.6)	271 (2.8)	278 (3.2)
	Nation	224 (1.1)	268 (1.4)	275 (1.3) >
Black	Pennsylvania	188 (3.3)	240 (3.0)	240 (4.9)
	Northeast	194 (3.3)	247 (8.2)!	240 (3.8)
	Nation	190 (1.7)	239 (2.6)	237 (2.1)
Hispanic	Pennsylvania	201 (3.2)	227 (5.3)	244 (3.8)!
	Northeast	199 (2.7)	*** (**.*)	240 (3.6)!
	Nation	197 (1.7)	241 (3.0)	243 (1.5)
TYPE OF COMMUNITY				
Advantaged urban	Pennsylvania	235 (5.4)!	286 (2.6)!	288 (8.8)!
	Northeast	241 (3.9)!	277 (9.4)!	291 (7.4)!
	Nation	239 (3.4)!	278 (4.5)!	285 (4.9)!
Disadvantaged urban	Pennsylvania	194 (4.1)	246 (5.5)!	246 (5.8)!
	Northeast	206 (4.3)!	246 (13.9)!	236 (3.6)!
	Nation	192 (3.1)	250 (3.6)!	240 (3.0)
Extreme rural	Pennsylvania	227 (3.0)!	268 (2.9)!	277 (3.6)!
	Northeast	*** (**.*)	*** (**.*)	*** (**.*)
	Nation	213 (3.7)	255 (4.2)!	268 (4.0)!
Other	Pennsylvania	224 (1.8)	266 (1.8)	274 (1.6) >
	Northeast	220 (2.6)	270 (3.6)	266 (2.8)
	Nation	217 (1.1)	261 (1.6)	267 (1.4)
PARENTS' EDUCATION				
Graduated college	Pennsylvania	227 (2.3)	279 (2.2)	282 (1.9)
	Northeast	230 (3.2)	280 (3.4)	281 (4.2)
	Nation	223 (1.5)	273 (1.6)	278 (1.7)
Some education after high school	Pennsylvania	232 (2.7)	270 (2.1)	274 (2.2)
	Northeast	230 (5.0)	265 (3.8)	265 (3.2)
	Nation	221 (1.9)	265 (1.7)	268 (1.7)
Graduated high school	Pennsylvania	218 (2.1)	254 (2.1)	260 (1.7)
	Northeast	215 (5.4)	258 (3.2)	259 (3.8)
	Nation	211 (1.9)	254 (1.5)	255 (1.4)
Did not finish high school	Pennsylvania	210 (3.2)	247 (3.4)	252 (3.2)
	Northeast	*** (**.*)	*** (**.*)	246 (4.0)
	Nation	202 (2.7)	240 (1.8)	248 (1.9)
I don't know	Pennsylvania	215 (2.1)	241 (4.6)	250 (4.0)
	Northeast	216 (2.7)	*** (**.*)	251 (2.8)
	Nation	211 (1.1)	239 (3.2)	251 (1.6) >
GENDER				
Male	Pennsylvania	221 (1.8)	266 (1.7)	271 (1.7)
	Northeast	223 (2.4)	267 (4.0)	265 (2.7)
	Nation	215 (1.1)	260 (1.6)	264 (1.3)
Female	Pennsylvania	221 (1.8)	264 (2.0)	269 (1.8)
	Northeast	221 (3.2)	268 (3.4)	268 (3.3)
	Nation	216 (1.6)	261 (1.4)	267 (1.4) >

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TABLE 14F

Fourth- and Eighth-Grade Public-School Performance in Estimation by Subpopulation

		1992 Grade 4	1992 Grade 8
		Proficiency	Proficiency
TOTAL			
	Pennsylvania	212 (1.6)	272 (1.3)
	Northeast	205 (6.8)!	269 (5.1)
	Nation	206 (1.8)	269 (1.5)
RACE/ETHNICITY			
White	Pennsylvania	221 (1.4)	276 (1.0)
	Northeast	222 (6.5)!	283 (4.3)
	Nation	218 (2.1)	276 (1.6)
Black	Pennsylvania	174 (3.9)	247 (3.7)
	Northeast	*** (**.*)	237 (4.6)!
	Nation	173 (3.5)	248 (3.5)
Hispanic	Pennsylvania	187 (2.9)	253 (4.0)!
	Northeast	*** (**.*)	245 (6.6)!
	Nation	190 (3.1)	252 (2.6)
TYPE OF COMMUNITY			
Advantaged urban	Pennsylvania	225 (5.3)!	290 (3.4)!
	Northeast	*** (**.*)	291 (2.8)!
	Nation	222 (4.6)!	285 (2.0)!
Disadvantaged urban	Pennsylvania	178 (5.2)	251 (4.1)!
	Northeast	*** (**.*)	234 (3.0)!
	Nation	173 (5.7)!	249 (5.9)!
Extreme rural	Pennsylvania	221 (1.9)!	276 (2.8)!
	Northeast	*** (**.*)	*** (**.*)
	Nation	189 (10.0)!	273 (5.9)!
Other	Pennsylvania	217 (1.9)	276 (1.4)
	Northeast	206 (6.9)!	264 (8.0)!
	Nation	211 (2.0)	268 (2.0)
PARENTS' EDUCATION			
Graduated college	Pennsylvania	220 (2.5)	282 (1.6)
	Northeast	217 (8.7)!	284 (4.8)
	Nation	216 (2.4)	279 (1.9)
Some education after high school	Pennsylvania	229 (4.0)	273 (1.8)
	Northeast	*** (**.*)	*** (**.*)
	Nation	219 (3.6)	273 (2.9)
Graduated high school	Pennsylvania	209 (2.6)	266 (1.4)
	Northeast	*** (**.*)	254 (5.9)
	Nation	201 (4.2)	261 (2.4)
Did not finish high school	Pennsylvania	200 (3.4)	258 (2.3)
	Northeast	*** (**.*)	*** (**.*)
	Nation	190 (4.6)	258 (3.3)
I don't know	Pennsylvania	202 (2.1)	252 (2.9)
	Northeast	191 (7.1)!	*** (**.*)
	Nation	196 (3.0)	252 (3.5)
GENDER			
Male	Pennsylvania	216 (1.9)	275 (1.5)
	Northeast	209 (5.8)!	271 (5.5)
	Nation	210 (1.9)	272 (1.7)
Female	Pennsylvania	208 (1.9)	269 (1.5)
	Northeast	200 (8.5)!	265 (5.4)
	Nation	203 (2.4)	266 (1.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). Estimation was not included in the 1990 Trial State Assessment. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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PART TWO

Finding a Context for Understanding Students' Mathematics Proficiency

In its landmark undertaking to set standards for mathematics curriculum and teaching, the National Council of Teachers of Mathematics (NCTM) made numerous recommendations for reforming how teachers teach the subject and how students learn it.[20] According to NCTM, to improve the nation's mathematics proficiency, all students must learn more, and often different, mathematics, and instruction in mathematics must be significantly revised.

The results of the Trial State Assessment can be used to monitor students' progress in achieving the NCTM recommendations and to examine both school and home contexts for educational support. The public-school students participating in the 1992 Trial State Assessment, their mathematics teachers, and the principals or other administrators in their schools were asked to complete questionnaires on policies, instruction, and programs. These student, teacher, and school data help to describe some of the current practices and emphases in mathematics education, illuminate some of the factors that appear to be related to fourth- and or eighth-grade public-school students' proficiency in the subject, and provide an educational context for understanding data on student achievement. The data from the questionnaires also provide a means to examine changes in policies, instruction, and programs at the eighth-grade level between 1990 and 1992 for those states and territories that participated in both Trial State Assessment Programs.

The questionnaire results provide a broad picture of educational practices prevalent in American schools and classrooms. It is important to note that the NAEP data cannot establish cause-and-effect links between various contextual factors and students' mathematics proficiency. However, the results do provide information about important relationships between the contextual factors and proficiency.

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[20] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989); *Professional Standards for Teaching Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1991).

In many instances, NAEP findings reveal that educational researchers' suggestions about what strategies work best to help students learn often go unheeded. For example, NCTM has recommended that teachers employ more hands-on activities and student-centered learning techniques. However, as described in Chapter 4, and similar to the findings from the 1990 NAEP mathematics assessment, NAEP data indicate that classroom work is still dominated by textbooks or worksheets. Also, it is widely recognized that home environment has an enormous impact on future academic achievement. Yet, as shown in Chapters 3 and 7, and again similar to the findings from the 1990 NAEP mathematics assessment, large proportions of students still report spending much more time each day watching television than doing mathematics homework.

The contextual information provided in Part Two of this report focuses on five major areas: instructional content, instructional practices and experiences, teacher characteristics, school characteristics and context, and conditions outside of school that affect instruction and learning. Part Two consists of five chapters. Chapter 3 discusses instructional content and its relationship to students' mathematics proficiency. Chapter 4 focuses on instructional practices -- how instruction is delivered. Chapter 5 is devoted to calculator and computer use, while Chapter 6 provides information about teachers and Chapter 7 examines students' home support for learning.

CHAPTER 3

What Are Students Taught in Mathematics?

According to NCTM, curricular reform in grades kindergarten through 4 is necessary and must address both the content and emphasis of the curriculum as well as approaches to instruction. The need for reform is equally great in grades 5 through 8, where the current curriculum also does not match NCTM's ideal.[21] This chapter focuses on curricular and instructional content issues in Pennsylvania public schools and their relationship to students' proficiency.

Table 15 provides a profile of the fourth- and eighth-grade public schools' policies and practices in Pennsylvania. Some of the salient results obtained from the school and teacher questionnaires are:

- According to the schools, about three quarters of the fourth-grade students and more than half of the eighth-grade students in Pennsylvania (71 percent and 64 percent, respectively) were in public schools where mathematics was identified as a special priority. This percentage for eighth grade stayed about the same* from 1990 to 19[illegible] (74 percent in 1990).

- According to the schools in Pennsylvania, almost all of the eighth-grade students (91 percent) could take an algebra course in eighth grade for high-school course placement or credit. This percentage of students stayed about the same from 1990 to 1992 (88 percent in 1990).

- According to the schools in Pennsylvania, 92 percent of the eighth-grade students were taught mathematics by teachers who teach only one subject. The percentage of eighth-grade public-school students who were so taught mathematics stayed about the same from 1990 to 1992 (94 percent in 1990).

- According to their teachers, less than half of the fourth-grade students and more than half of the eighth-grade students (42 percent and 69 percent, respectively) were typically taught mathematics in a class that was grouped by mathematics ability. For eighth-grade public-school students, this percentage decreased from 1990 to 1992 (81 percent in 1990).

- According to their mathematics teachers, 67 percent of the fourth-grade students and 24 percent of the eighth-grade students received four or more hours of mathematics instruction per week.

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* Recall that "about the same" means that the difference between these two groups, although it may appear large, is not statistically significant.

[21] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989); *Professional Standards for Teaching Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1991).

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TABLE 15

Mathematics Policies and Practices in Pennsylvania Fourth-Grade and Eighth-Grade Public Schools

	Grade 4	Grade 8	
	1992	1990	1992
	Percentage	**Percentage**	**Percentage**
Percentage of students in public schools that identified ***mathematics as receiving special emphasis*** in school-wide goals and objectives, instruction, in-service training, etc.			
Pennsylvania	71 (4.6)	74 (4.5)	64 (4.7)
Northeast	81 (7.1)	45 (16.5)	80 (8.4)
Nation	74 (3.4)	63 (5.9)	68 (3.7)
Percentage of eighth-grade public-school students who are ***offered a course in algebra*** for high school course placement or credit			
Pennsylvania	--- (--,-)	88 (3.6)	91 (2.9)
Northeast	— (--,-)	90 (7.3)	78 (5.0)
Nation	--- (--,-)	78 (4.6)	79 (3.8)
Percentage of eighth-grade students in public schools who are taught by ***teachers who teach only mathematics***			
Pennsylvania	--- (--,-)	94 (2.1)	92 (2.8)
Northeast	--- (--,-)	100 (0.0)	93 (4.6)
Nation	--- (--,-)	91 (3.3)	89 (2.3)
Percentage of students in public schools who are ***assigned to a mathematics class by their ability*** in mathematics			
Pennsylvania	42 (4.3)	81 (3.1)	69 (3.5) <
Northeast	40 (7.1)	71 (10.1)	78 (5.5)
Nation	27 (3.0)	63 (4.0)	61 (2.6)
Percentage of students in public schools who receive ***four or more hours of mathematics instruction per week***			
Pennsylvania	67 (3.4)	--- (--,-)	24 (2.9)
Northeast	73 (6.8)	— (--,-)	35 (7.9)
Nation	74 (2.5)	--- (--,-)	32 (3.1)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. — Item does not apply to Grade 4, or comparisons to 1990 are not appropriate because of a change in the format of the question. In 1990, the students' mathematics teachers were asked to specify the number of hours they spent providing mathematics instruction each week. In 1992, the form of the question was changed. Instead of asking the teachers to specify the number of hours, the teachers were asked to select from three options: that they spent (a) Two and one-half hours or less; (b) More than two and one-half hours but less than four hours; or (c) Four hours or more providing mathematics instruction per week.

CURRICULUM COVERAGE

Course taking is related to mathematics proficiency because students who take more mathematics classes tend to learn more mathematics than those students who take fewer classes in this subject, or because students who are more proficient tend to take more mathematics courses and, in some cases, because the higher-achieving students are tracked into more advanced courses.[22] To place students' mathematics proficiency in a curriculum-related context, it is necessary to examine the extent to which students in Pennsylvania are taking mathematics courses. Typically, all fourth-grade students take mathematics. All eighth graders, with very few exceptions, also take mathematics. However, the eighth graders take different types of mathematics courses, as shown in Table 16.

- A smaller percentage of students in Pennsylvania were taking eighth-grade mathematics (42 percent) than were taking a course in pre-algebra or algebra (55 percent). Across the nation, however, about the same percentage of students were taking eighth-grade mathematics (50 percent) as were taking a course in pre-algebra or algebra (47 percent).
- Students in Pennsylvania who were enrolled in eighth-grade mathematics courses exhibited lower average mathematics proficiency than did those who were in pre-algebra or algebra courses.
- About the same* percentage of students in Pennsylvania were taking algebra or pre-algebra in 1992 as in 1990. Across the nation, however, a greater percentage of students were taking algebra or pre-algebra in 1992 than in 1990.

Further, from Table A16 (Page 154) in the Data Appendix:[23]

- About the same percentage of eighth-grade females (57 percent) as males (52 percent) in Pennsylvania were enrolled in pre-algebra or algebra courses.
- In Pennsylvania, 56 percent of White students, 49 percent of Black students, and 36 percent of Hispanic students were enrolled in pre-algebra or algebra courses.
- In addition, 82 percent of students attending schools in advantaged urban areas, 55 percent of students in disadvantaged urban areas, 53 percent of students in extreme rural areas, and 52 percent of students in areas classified as "other" were enrolled in pre-algebra or algebra courses.

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* Recall that "about the same" means that the difference between these two groups, although it may appear large, is not statistically significant.

[22] Ina V.S. Mullis, John A. Dossey, Eugene H. Owen, and Gary W. Phillips. *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States.* (Washington, DC: National Center for Education Statistics, 1991).

[23] For every table in the body of the report that includes estimates of average proficiency, the Data Appendix provides a corresponding table presenting the results for the four subpopulations -- race ethnicity, type of community, parents' education level, and gender. Results for the region are contained in *The 1992 State of Mathematics Achievement: NAEP's Assessment of the Nation and the Trial Assessment of the States.* (Washington, DC: National Center for Education Statistics, 1993).

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TABLE 16

Eighth-Grade Students' Reports on the Mathematics Class They Are Taking

	Grade 8	
	1990	1992
What kind of mathematics class are you taking this year?	**Percentage and Proficiency**	**Percentage and Proficiency**
Eighth-grade Mathematics		
Pennsylvania	49 (2.5) 248 (1.6)	42 (2.5) 256 (1.7) >
Northeast	63 (5.8) 259 (3.1)	47 (3.0) < 252 (3.9)
Nation	62 (2.1) 251 (1.4)	50 (2.9) < 253 (1.5)
Pre-algebra		
Pennsylvania	24 (2.2) 275 (1.5)	27 (2.4) 271 (2.0)
Northeast	16 (3.9) 278 (8.5)!	22 (2.5) 272 (3.5)
Nation	19 (1.9) 271 (2.6)	28 (2.5) > 271 (1.7)
Algebra		
Pennsylvania	25 (1.6) 296 (1.6)	27 (1.7) 296 (1.9)
Northeast	18 (3.3) 299 (3.2)	26 (3.0) 296 (4.9)
Nation	15 (1.2) 298 (2.4)	19 (1.2) 299 (2.0)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. The percentages may not total 100 percent because a small number of students reported taking other or no mathematics classes. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic.

MATHEMATICS HOMEWORK

To examine the relationship between homework and proficiency in mathematics, the teachers of the assessed students were asked to report the amount of mathematics homework they *assigned* each day, and students were asked to report the amount of time they *spent* on mathematics homework each day. Table 17 reports the teachers' and students' responses.

As reported by their mathematics teachers:[24]

- In Pennsylvania, 1 percent of the fourth-grade students and 0 percent of the eighth-grade students were not assigned any mathematics homework each day.
- In addition, 0 percent of the fourth-grade students and 1 percent of the eighth-grade students in Pennsylvania were assigned an hour or more of mathematics homework each day.
- The greatest percentage of fourth-grade students were assigned either 15 or 30 minutes of mathematics homework each day, and the greatest percentage of eighth-grade students were assigned 30 minutes of mathematics homework each day.

According to the students:

- In Pennsylvania, 2 percent of the fourth-grade students and 5 percent of the eighth-grade students did not spend any time each day on mathematics homework (either none was assigned or the students did not do the homework).
- In addition, 10 percent of the fourth-grade students and 6 percent of the eighth-grade students in Pennsylvania spent an hour or more on mathematics homework.
- In grade 8, average mathematics proficiency was higher for students in Pennsylvania who spent 45 minutes on mathematics homework than for students who spent no time on mathematics homework each day.
- From 1990 to 1992, there was no significant difference in the percentage of eighth-grade students who did not spend any time each day on mathematics homework (5 percent in 1990 and 5 percent in 1992).
- From 1990 to 1992, there was no significant difference in the percentage of eighth-grade students who spent an hour or more each day on mathematics homework (8 percent in 1990 and 6 percent in 1992).

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[24] Comparisons between 1990 and 1992 are not possible for the teacher responses because of changes in the form of the questions that they were asked.

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TABLE 17

Teachers' and Students' Reports on the Amount of Time Students Spend on Mathematics Homework Each Day

	Grade 4		Grade 8			
	1992		1990		1992	
	Teacher	Student	Teacher	Student	Teacher	Student
About how much time do students spend on (are they assigned) mathematics homework each day?	Percentage and Proficiency		Percentage and Proficiency		Percentage and Proficiency	
None						
Pennsylvania	1 (0.4) *** (**.*)	2 (0.4) 215 (5.4)	--- (--.-) --- (--.-)	5 (0.5) 250 (4.2)	0 (0.1) *** (**.*)	5 (0.6) 251 (3.6)
Northeast	2 (2.0) *** (**.*)	3 (0.5) *** (**.*)	--- (--.-) --- (--.-)	6 (1.2) *** (**.*)	1 (0.5) *** (**.*)	7 (0.9) 255 (5.9)
Nation	6 (1.4) 220 (2.7)!	7 (0.7) 221 (2.4)	--- (--.-) --- (--.-)	9 (0.8) 251 (2.9)	3 (0.7) 232 (4.1)!	8 (0.4) 253 (2.4)
15 minutes						
Pennsylvania	53 (3.6) 225 (1.7)	50 (1.6) 228 (1.7)	--- (--.-) --- (--.-)	41 (1.1) 269 (1.6)	33 (3.1) 259 (2.4)	37 (1.4) 271 (1.5)
Northeast	50 (6.2) 224 (4.7)	45 (3.5) 226 (3.0)	--- (--.-) --- (--.-)	37 (3.3) 270 (2.6)	29 (5.0) 264 (5.4)!	33 (2.5) 267 (3.6)
Nation	53 (2.1) 220 (1.5)	39 (1.1) 220 (1.2)	--- (--.-) --- (--.-)	31 (2.0) 264 (1.7)	29 (2.1) 262 (1.8)	28 (0.8) 268 (1.4)
30 minutes						
Pennsylvania	44 (3.6) 221 (2.2)	28 (1.1) 224 (1.5)	--- (--.-) --- (--.-)	35 (0.7) 268 (1.9)	60 (2.9) 274 (2.0)	38 (1.2) 273 (1.8)
Northeast	44 (5.7) 220 (3.1)	30 (2.7) 229 (3.1)	--- (--.-) --- (--.-)	34 (2.6) 271 (5.8)	59 (6.2) 264 (3.6)	36 (1.5) 271 (4.5)
Nation	36 (2.6) 215 (1.8)	29 (0.8) 221 (1.1)	--- (--.-) --- (--.-)	32 (1.2) 263 (1.9)	48 (2.6) 267 (1.5)	35 (0.7) > 268 (1.3)
45 minutes						
Pennsylvania	2 (0.8) *** (**.*)	10 (0.7) 215 (2.2)	--- (--.-) --- (--.-)	11 (0.7) 264 (2.7)	6 (1.0) 298 (4.3)	14 (0.7) > 275 (2.9) >
Northeast	3 (1.4) *** (**.*)	12 (1.2) 216 (3.9)	--- (--.-) --- (--.-)	15 (2.3) 272 (6.7)	9 (4.7) 306 (7.8)!	15 (1.3) 276 (3.6)
Nation	4 (0.9) 200 (4.7)!	12 (0.5) 217 (1.6)	--- (--.-) --- (--.-)	16 (1.0) 266 (2.1)	15 (2.0) 282 (3.8)	16 (0.6) 269 (1.7)
An hour or more						
Pennsylvania	0 (0.3) *** (**.*)	10 (0.7) 207 (2.2)	--- (--.-) --- (--.-)	8 (0.6) 265 (3.6)	1 (0.5) *** (**.*)	6 (0.8) 261 (4.4)
Northeast	1 (1.1) *** (**.*)	11 (1.4) 205 (4.6)	--- (--.-) --- (--.-)	8 (1.7) *** (**.*)	2 (0.8) *** (**.*)	8 (1.3) 265 (6.3)
Nation	1 (0.4) *** (**.*)	12 (0.7) 204 (1.8)	--- (--.-) --- (--.-)	12 (1.1) 258 (3.0)	4 (0.9) 286 (5.4)!	13 (0.7) 265 (2.0)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. --- Comparisons between 1990 and 1992 are not possible for the teacher responses because of changes in the form of the questions that they were asked. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

INSTRUCTIONAL EMPHASIS

According to NCTM, the teaching of computation and other traditional skills has dominated the mathematics curriculum at grades kindergarten through 4, while at grades 5 through 8, a repetition of topics, instructional approaches, and presentation have prevailed. In contrast, NCTM recommends that students be taught a broad range of mathematics topics, including number concepts, computation, estimation, functions, algebra, statistics, probability, geometry, and measurement.[25]

Because the Trial State Assessment questions were designed to measure students' knowledge, skills, and understandings in various content areas -- regardless of the type of mathematics class in which students were enrolled -- the teachers of the assessed students were asked a series of questions about the amount of emphasis they gave to each of five mathematics topics during the school year. Each topic corresponded to one of the five mathematics content areas included in the Trial State Assessment -- Numbers and Operations; Measurement; Geometry; Data Analysis, Statistics, and Probability; and Algebra and Functions. The teachers' responses provide an indication of students' opportunity to learn those topics recommended by NCTM.

The teachers were asked whether they were placing "heavy," "moderate," or "little or no" emphasis on each topic. Table 18 provides the results for this analysis and the average student proficiency in each content area.

From Table 18:

- In Pennsylvania, 95 percent of the fourth-grade students had mathematics teachers who placed heavy instructional emphasis on Numbers and Operations, 13 percent had teachers who placed heavy instructional emphasis on Measurement, 4 percent had teachers who placed heavy instructional emphasis on Geometry, 4 percent had teachers who placed heavy instructional emphasis on Data Analysis, Statistics, and Probability, and 2 percent had teachers who placed heavy instructional emphasis on Algebra and Functions.

- In Pennsylvania, 72 percent of the eighth-grade students had mathematics teachers who placed heavy instructional emphasis on Numbers and Operations, 11 percent had teachers who placed heavy instructional emphasis on Measurement, 18 percent had teachers who placed heavy instructional emphasis on Geometry, 10 percent had teachers who placed heavy instructional emphasis on Data Analysis, Statistics, and Probability, and 48 percent had teachers who placed heavy instructional emphasis on Algebra and Functions.

- Comparisons between 1990 an 1992 for two content areas -- Numbers and Operations and Data Analysis, Statistics, and Probability -- are not appropriate because of changes in the form of the questions that the students' mathematics teachers were asked. There was no change in the percentage of eighth-grade students whose teachers placed heavy instructional emphasis on Measurement, Geometry, or Algebra and Functions from 1990 and 1992.

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[25] *Curriculum and Evaluation Standards for School Mathematics* (Reston, Va.: National Council of Teachers of Mathematics, 1989).

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TABLE 18

Teachers' Reports on the Emphasis Given to Specific Mathematics Content Areas

Teacher "emphasis" categories by content areas			Grade 4	Grade 8	
			1992	1990	1992
			Percentage and Proficiency	Percentage and Proficiency	Percentage and Proficiency
Numbers and Operations					
Pennsylvania		Heavy emphasis	95 (1.3) 221 (1.7)	--- (--.-) --- (--.-)	72 (2.6) 270 (1.5)
		Little or no emphasis	0 (0.0) *** (**.*)	--- (--.-) --- (--.-)	3 (0.8) 306 (5.2)!
Northeast		Heavy emphasis	86 (3.4) 218 (3.4)	--- (--.-) --- (--.-)	79 (4.3) 272 (3.8)
		Little or no emphasis	0 (0.0) *** (**.*)	--- (--.-) --- (--.-)	4 (1.3) *** (**.*)
Nation		Heavy emphasis	92 (1.3) 214 (1.3)	--- (--.-) --- (--.-)	76 (1.9) 269 (1.2)
		Little or no emphasis	0 (0.1) *** (**.*)	--- (--.-) --- (--.-)	4 (0.8) 283 (6.9)!
Measurement					
Pennsylvania		Heavy emphasis	13 (1.7) 232 (4.0)	15 (2.2) 252 (3.4)	11 (2.3) 257 (7.2)!
		Little or no emphasis	6 (1.6) 230 (6.9)!	43 (2.9) 275 (3.7)	25 (2.7) < 289 (4.0)
Northeast		Heavy emphasis	11 (2.4) 212 (6.2)!	32 (11.5) 257 (10.3)!	22 (5.5) 263 (4.6)!
		Little or no emphasis	8 (3.3) *** (**.*)	34 (8.3) 283 (5.3)!	16 (3.3) 277 (9.8)!
Nation		Heavy emphasis	14 (1.7) 217 (2.6)	17 (3.0) 250 (4.8)	16 (2.0) 255 (3.0)
		Little or no emphasis	6 (1.2) 221 (3.8)!	33 (4.0) 272 (3.9)	15 (1.6) < 281 (3.4)
Geometry					
Pennsylvania		Heavy emphasis	4 (1.2) 229 (6.0)!	17 (2.7) 260 (3.0)	18 (2.8) 263 (3.7)
		Little or no emphasis	19 (2.5) 218 (2.7)	34 (3.0) 269 (4.2)	16 (2.0) < 270 (4.5)
Northeast		Heavy emphasis	4 (2.4) *** (**.*)	46 (11.9) 264 (6.1)!	21 (4.7) 265 (4.3)!
		Little or no emphasis	18 (2.3) 213 (3.8)	9 (1.9) *** (**.*)	10 (4.2) 256 (19.8)!
Nation		Heavy emphasis	6 (1.1) 212 (5.0)	28 (3.8) 259 (3.0)	18 (2.6) 263 (2.3)
		Little or no emphasis	22 (2.8) 217 (1.9)	21 (3.3) 264 (5.4)	11 (1.4) < 264 (4.4)
Data Analysis, Statistics, and Probability					
Pennsylvania		Heavy emphasis	4 (1.1) 226 (7.3)!	--- (--.-) --- (--.-)	10 (2.3) 280 (4.7)!
		Little or no emphasis	53 (4.1) 219 (1.8)	--- (--.-) --- (--.-)	51 (3.1) 273 (2.6)
Northeast		Heavy emphasis	6 (2.5) *** (**.*)	--- (--.-) --- (--.-)	17 (5.8) 273 (11.1)!
		Little or no emphasis	48 (6.2) 214 (3.4)	--- (--.-) --- (--.-)	27 (5.2) 266 (7.4)!
Nation		Heavy emphasis	7 (1.2) 222 (4.2)	--- (--.-) --- (--.-)	11 (1.7) 273 (4.8)
		Little or no emphasis	52 (2.8) 215 (1.4)	--- (--.-) --- (--.-)	30 (2.0) 268 (2.6)

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(continued on next page)

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TABLE 18 (continued) | Teachers' Reports on the Emphasis Given to Specific Mathematics Content Areas

		Grade 4	Grade 8	
		1992	1990	1992
Teacher "emphasis" categories by content areas		**Percentage and Proficiency**	**Percentage and Proficiency**	**Percentage and Proficiency**
Algebra and Functions				
Pennsylvania	Heavy emphasis	2 (0.9) *** (**.*)	48 (2.8) 282 (2.1)	48 (2.5) 284 (2.2)
	Little or no emphasis	72 (3.1) 218 (1.7)	20 (2.3) 238 (2.5)	16 (2.1) 248 (4.2)
Northeast	Heavy emphasis	3 (1.7) *** (**.*)	52 (11.5) 274 (8.2)!	38 (3.2) 293 (4.6)
	Little or no emphasis	66 (4.5) 220 (2.7)	14 (6.6) *** (**.*)	22 (3.9) 241 (4.7)
Nation	Heavy emphasis	4 (1.1) 218 (4.3)!	46 (3.6) 275 (2.6)	46 (2.1) 282 (2.1)
	Little or no emphasis	65 (3.5) 215 (1.5)	20 (3.0) 244 (3.2)	13 (1.5) 241 (2.8)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. The percentages may not total 100 percent because the "Moderate Emphasis" category is not included. --- Comparisons between 1990 and 1992 for two content areas (Numbers and Operations and Data Analysis, Statistics, and Probability) are not appropriate because of changes in the form of the questions that the students' mathematics teachers were asked. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

SUMMARY

The opportunity for all students to experience the components of mathematics training as outlined in the NCTM *Standards* is at the heart of NCTM's recommendations for quality mathematics programs.[26] The information on curriculum coverage, mathematics homework, and instructional emphasis has revealed the following:

- According to their mathematics teachers, 67 percent of the fourth-grade students and 24 percent of the eighth-grade students received four or more hours of mathematics instruction per week.
- According to their mathematics teachers, almost all of the eighth-grade students (91 percent) could take an algebra course in eighth grade for high-school course placement or credit. This percentage of students stayed about the same from 1990 to 1992 (88 percent in 1990).
- Students in Pennsylvania who were enrolled in eighth-grade mathematics courses exhibited lower average mathematics proficiency than did those who were in pre-algebra or algebra courses.

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[26] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989).

- According to their mathematics teachers, the greatest percentage of fourth-grade students were assigned either 15 or 30 minutes of mathematics homework each day, and the greatest percentage of eighth-grade students were assigned 30 minutes of mathematics homework each day.

- In grade 8, average mathematics proficiency was higher for students in Pennsylvania who spent 45 minutes on mathematics homework than for students who spent no time on mathematics homework each day.

- In Pennsylvania, 95 percent of the fourth-grade students had mathematics teachers who placed heavy instructional emphasis on Numbers and Operations, 13 percent had teachers who placed heavy instructional emphasis on Measurement, 4 percent had teachers who placed heavy instructional emphasis on Geometry, 4 percent had teachers who placed heavy instructional emphasis on Data Analysis, Statistics, and Probability, and 2 percent had teachers who placed heavy instructional emphasis on Algebra and Functions.

- In Pennsylvania, 72 percent of the eighth-grade students had mathematics teachers who placed heavy instructional emphasis on Numbers and Operations, 11 percent had teachers who placed heavy instructional emphasis on Measurement, 18 percent had teachers who placed heavy instructional emphasis on Geometry, 10 percent had teachers who placed heavy instructional emphasis on Data Analysis, Statistics, and Probability, and 48 percent had teachers who placed heavy instructional emphasis on Algebra and Functions.

CHAPTER 4

How Is Mathematics Instruction Delivered?

Mathematics instruction has been characterized by extensive use of textbooks and worksheets.[27] However, according to NCTM, what a student learns depends to a great degree on how he or she has learned it, and classroom instruction needs to be more student centered.[28]

To provide information about instructional delivery, public-school students and teachers participating in the Trial State Assessment were asked to report on the use of various teaching and learning activities in their mathematics classrooms. Students' and teachers' responses to a series of questions on their mathematics instruction provide an indication of the extent to which teachers are making use of student-centered activities.

RESOURCES

NCTM recommends well-equipped classrooms and instruction reflecting the vitality of mathematics.[29] To examine the availability of resources, the assessed students' teachers were asked about the extent to which they were able to obtain all of the resources they needed.

From Table 19 and Table A19 (Page 174) in the Data Appendix:

- In Pennsylvania, 10 percent of the fourth-grade students and 20 percent of the eighth-grade students had mathematics teachers who reported getting all of the resources they needed, while 33 percent of the fourth-grade students and 29 percent of the eighth-grade students were taught by teachers who got some or none of the resources they needed.

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[27] Thomas A. Romberg and Thomas P. Carpenter, "Research on Teaching and Learning Mathematics: Two Disciplines of Scientific Inquiry," in *Handbook of Research on Teaching (Third Edition)*, M.C. Wittrock, Ed. (New York, NY: Macmillian, 1980).

[28] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989).

[29] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989); *Professional Standards for Teaching Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1991).

- In grade 4, 18 percent of students attending schools in advantaged urban areas, 2 percent of students in disadvantaged urban areas, 12 percent of students in extreme rural areas, and 11 percent of students in areas classified as "other" had mathematics teachers who got all the resources they needed. In grade 8, these percentages were 0 percent of students attending schools in advantaged urban areas, 8 percent of students in disadvantaged urban areas, 27 percent of students in extreme rural areas, and 25 percent of students in areas classified as "other".

- By comparison, in grade 4, 28 percent of students in advantaged urban areas, 48 percent of students in disadvantaged urban areas, 23 percent of students in extreme rural areas, and 34 percent of students in areas classified as "other" had mathematics teachers who got some or none of the resources they needed. These figures for grade 8 were 14 percent of students in advantaged urban areas, 54 percent of students in disadvantaged urban areas, 17 percent of students in extreme rural areas, and 21 percent of students in areas classified as "other".

- At both grade 4 and grade 8, students whose teachers got all of the resources they needed had higher proficiencies than did students whose teachers got some or none of the resources they needed.

- Between 1990 and 1992, there was no significant difference in the percentage of eighth-grade students whose teachers got all the resources they needed (19 percent in 1990 and 20 percent in 1992). There was no significant difference in the percentage of students whose teachers got some or none of the resources they needed (29 percent in 1990 and 29 percent in 1992).

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TABLE 19 | Teachers' Reports on the Availability of Resources

Which of the following statements is true about how well supplied you are by your school system with the instructional materials and other resources you need to teach your class?	Grade 4	Grade 8	
	1992	1990	1992
	Percentage and Proficiency	**Percentage and Proficiency**	**Percentage and Proficiency**
I get all the resources I need			
Pennsylvania	10 (2.1) 233 (4.1)	19 (3.6) 273 (3.7)	20 (2.8) 272 (2.8)
Northeast	11 (3.3) 233 (3.9)!	26 (6.6) 272 (7.1)!	12 (4.6) 274 (5.9)!
Nation	11 (1.7) 221 (2.8)	13 (2.4) 264 (3.7)	13 (2.3) 272 (3.4)
I get most of the resources I need			
Pennsylvania	56 (3.5) 227 (1.7)	52 (3.6) 267 (2.0)	51 (3.5) 274 (2.0) >
Northeast	45 (5.4) 228 (3.3)	38 (11.7) 272 (3.3)!	51 (5.1) 277 (3.4)
Nation	52 (3.0) 220 (1.3)	56 (4.0) 265 (2.0)	53 (2.5) 269 (1.1)
I get some or none of the resources I need			
Pennsylvania	33 (3.6) 215 (2.5)	29 (3.3) 260 (3.6)	29 (3.4) 263 (3.2)
Northeast	44 (6.1) 215 (4.3)	36 (11.6) 274 (10.0)!	37 (4.6) 250 (3.3)
Nation	37 (3.5) 213 (2.0)	31 (4.2) 260 (3.1)	33 (1.9) 261 (1.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic.

COLLABORATING IN SMALL GROUPS

NCTM and others have recommended the use of small groups and cooperative-learning strategies for mathematics teaching in the middle grades.[30] Mathematics is suited for group discussion because students in groups can learn multiple strategies for solving the same problems and discuss the merits of different solutions to problems. Further, the positive affective impact of working together mirrors the use of mathematics in the workplace and reduces mathematics anxiety.[31] To examine the extent to which small groups are being used, students and their mathematics teachers were asked about the prevalence of these practices (Table 20).

According to their mathematics teachers:

- More than half of the fourth-grade students in Pennsylvania (59 percent) and less than half of the eighth-grade students (41 percent) worked mathematics problems in small groups at least weekly; some in grade 4 and about one quarter in grade 8 never or hardly ever worked mathematics problems in small groups (12 percent and 21 percent, respectively).

- About the same* percentage of eighth-grade students in 1992 compared to 1990 worked mathematics problems in small groups at least weekly (41 percent in 1992 and 33 percent in 1990).

- About the same percentage of eighth-grade students in 1992 compared to 1990 never or hardly ever worked mathematics problems in small groups (21 percent in 1992 and 21 percent in 1990).

According to students:

- In Pennsylvania, 38 percent of the fourth-grade students and 32 percent of the eighth-grade students worked mathematics problems in small groups at least weekly; 43 percent in grade 4 and 41 percent in grade 8 reported never or hardly ever working mathematics problems in small groups.

- A greater percentage of eighth-grade students in 1992 compared to 1990 worked mathematics problems in small groups at least weekly (32 percent in 1992 and 17 percent in 1990).

- A smaller percentage of eighth-grade students in 1992 compared to 1990 never or hardly ever worked mathematics problems in small groups (41 percent in 1992 and 58 percent in 1990).

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* Recall that "about the same" means that the difference between these two groups, although it may appear large, is not statistically significant.

[30] David W. Johnson and Roger T. Johnson, "Using Cooperative Learning in Math," in *Cooperative Learning in Mathematics*, Neil Davidson, Ed. (Menlo Park, CA: Addison-Wesley Publishing Company); *Curriculum and Evaluation Standards for School Mathematics* (Reston, Va: National Council of Teachers of Mathematics, 1989); *Professional Standards for Teaching Mathematics* (Reston, Va: National Council of Teachers of Mathematics, 1991).

[31] Ina V.S. Mullis, John A. Dossey, Eugene H. Owen, and Gary W. Phillips, *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States* (Washington, DC: National Center for Education Statistics, 1991).

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TABLE 20

Teachers' and Students' Reports on the Frequency of Small-Group Work

	Grade 4		Grade 8			
	1992		1990		1992	
	Teacher	Student	Teacher	Student	Teacher	Student
About how often do students work in small groups?	**Percentage and Proficiency**		**Percentage and Proficiency**		**Percentage and Proficiency**	
At least weekly						
Pennsylvania	59 (3.5) 225 (1.9)	38 (1.8) 220 (2.2)	33 (3.3) 265 (2.7)	17 (1.4) 263 (3.0)	41 (3.7) 269 (3.0)	32 (1.9) > 269 (2.4)
Northeast	68 (4.0) 225 (3.3)	40 (2.7) 217 (3.2)	44 (8.4) 264 (6.1)!	27 (6.7) 261 (6.0)!	50 (4.7) 271 (4.7)	34 (3.4) 268 (5.1)
Nation	65 (2.9) 218 (1.4)	37 (1.1) 213 (1.1)	50 (4.4) 260 (2.2)	28 (2.5) 258 (2.7)	51 (2.6) 269 (1.6) >	36 (1.3) > 265 (1.5)
Less than once a week						
Pennsylvania	30 (3.2) 221 (2.1)	20 (1.1) 232 (1.7)	46 (3.2) 268 (2.2)	25 (1.5) 271 (2.1)	38 (3.3) 274 (2.1)	27 (1.3) 275 (1.9)
Northeast	22 (3.1) 208 (3.0)	19 (1.8) 235 (4.6)	39 (8.6) 268 (4.8)!	22 (2.8) 272 (5.5)	28 (4.7) 266 (5.1)	27 (2.3) 270 (3.6)
Nation	27 (2.3) 216 (1.8)	19 (0.8) 228 (1.6)	43 (4.1) 264 (2.5)	28 (1.4) 267 (1.9)	32 (2.6) 266 (2.2)	26 (1.0) 270 (1.4)
Never or hardly ever						
Pennsylvania	12 (2.3) 219 (5.1)	43 (1.8) 222 (1.6)	21 (3.2) 268 (4.3)	58 (2.2) 266 (1.9)	21 (2.6) 267 (3.0)	41 (2.1) < 270 (1.6)
Northeast	11 (3.1) 219 (5.8)!	42 (2.9) 223 (1.7)	17 (6.5) *** (**.*)	51 (7.9) 274 (4.6)	22 (3.7) 260 (5.7)	39 (3.1) 267 (3.2)
Nation	8 (1.4) 215 (3.0)	44 (1.2) 217 (0.9)	8 (2.0) 279 (5.5)!	44 (2.9) 262 (1.5)	17 (2.2) > 267 (2.9)	38 (1.8) 266 (1.3)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

USING MATHEMATICAL OBJECTS

Regular use of concrete materials and tools can have a significant effect on both student achievement and attitudes toward mathematics.[32] To examine the use of mathematical objects, students and their mathematics teachers were asked to report on the frequency with which they used mathematical objects such as rulers, counting blocks, or geometric shapes (grade 4) or measuring instruments or geometric solids (grade 8). Table 21 summarizes these data.

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[32] E.J. Sowell, "Effects of Manipulative Materials in Mathematics Instruction," *Journal for Research in Mathematics Education, 20* (5), (November, 1989), pp. 498-505.

- According to their mathematics teachers, some of the fourth-grade students and about half of the eighth-grade students in Pennsylvania (14 percent and 50 percent, respectively) never or hardly ever used mathematical objects; 33 percent in fourth grade and 6 percent in eighth grade used these objects at least weekly.

- According to the students, less than half of the fourth-grade students and more than half of the eighth-grade students in Pennsylvania (36 percent and 60 percent, respectively) never or hardly ever used mathematical objects; 34 percent in fourth grade and 16 percent in eighth grade used these objects at least weekly.

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TABLE 21

Teachers' and Students' Reports on the Use of Mathematical Objects

	1992 Grade 4		1992 Grade 8	
	Teacher	Student	Teacher	Student
Grade 4: About how often do students use objects like rulers, counting blocks, or geometric shapes? Grade 8: About how often do students work with measuring instruments or geometric solids?	Percentage and Proficiency		Percentage and Proficiency	
At least weekly				
Pennsylvania	33 (3.5) 223 (2.3)	34 (1.9) 220 (1.7)	6 (1.7) 267 (3.6)!	16 (1.3) 265 (2.5)
Northeast	43 (7.0) 220 (5.3)	36 (2.7) 222 (3.7)	8 (3.0) 266 (6.0)!	21 (2.7) 263 (4.3)
Nation	46 (3.0) 218 (1.9)	35 (1.3) 215 (1.4)	7 (1.1) 270 (3.7)	20 (1.2) 263 (1.7)
Less than once a week				
Pennsylvania	53 (3.7) 224 (1.9)	29 (1.3) 230 (1.6)	44 (3.5) 263 (1.9)	24 (1.1) 273 (2.0)
Northeast	46 (6.2) 220 (3.7)	26 (2.3) 229 (2.6)	48 (6.3) 267 (4.6)	27 (1.8) 270 (4.9)
Nation	44 (2.9) 216 (1.7)	24 (0.9) 226 (1.1)	50 (3.3) 265 (1.5)	27 (1.1) 272 (1.4)
Never or hardly ever				
Pennsylvania	14 (2.3) 220 (4.5)	36 (1.8) 222 (1.8)	50 (3.8) 277 (2.4)	60 (1.6) 271 (1.6)
Northeast	11 (5.2) 220 (5.4)!	38 (2.0) 220 (2.5)	44 (7.8) 270 (5.9)	52 (3.2) 269 (2.8)
Nation	10 (1.8) 219 (2.6)	41 (1.3) 214 (1.1)	42 (3.3) 271 (2.1)	52 (1.6) 265 (1.1)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). Comparisons to 1990 are not appropriate because of a change in the wording or format of the question.
! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic.

MATERIALS FOR MATHEMATICS INSTRUCTION

Results from the 1990 NAEP mathematics assessment confirmed that high percentages of eighth-grade public-school students in Pennsylvania frequently worked mathematics problems from textbooks or worksheets. The results from the 1992 assessment indicate that these materials continue to play a major role in mathematics teaching and learning at both fourth grade and eighth grade.

Regarding the frequency of textbook usage, according to the students' mathematics teachers (Table 22 and Table A22A [Page 184] in the Data Appendix):

- In Pennsylvania, 83 percent of the fourth-grade students and 86 percent of the eighth-grade students were assigned problems from a mathematics textbook almost every day; 2 percent and 2 percent in fourth and eighth grade, respectively, worked textbook problems less than weekly.
- In grade 4, textbooks were used almost every day by 81 percent of students attending schools in advantaged urban areas, 63 percent of students in disadvantaged urban areas, 90 percent of students in extreme rural areas, and 91 percent of students in areas classified as "other". These figures for grade 8 were 90 percent of students attending schools in advantaged urban areas, 78 percent of students in disadvantaged urban areas, 91 percent of students in extreme rural areas, and 89 percent of students in areas classified as "other".
- Comparing eighth-grade students' mathematics teachers' responses in 1990 with 1992, a greater percentage of students in 1992 (86 percent) than in 1990 (74 percent) used textbooks almost every day.

According to the students themselves (Tables 22 and A22B [Page 186] in the Data Appendix):

- In Pennsylvania, 71 percent of the fourth-grade students and 85 percent of the eighth-grade students were assigned problems from a mathematics textbook almost every day; 12 percent and 5 percent in fourth and eighth grade, respectively, worked textbook problems less than weekly.
- In grade 4, textbooks were used almost every day by 75 percent of students attending schools in advantaged urban areas, 66 percent of students in disadvantaged urban areas, 72 percent of students in extreme rural areas, and 72 percent of students in areas classified as "other". For grade 8, these percentages were 93 percent of students in advantaged urban areas, 76 percent of students in disadvantaged urban areas, 90 percent of students in extreme rural areas, and 86 percent of students in areas classified as "other".
- Comparing eighth-grade students' responses in 1990 with 1992, a greater percentage of students in 1992 (85 percent) than in 1990 (75 percent) used textbooks almost every day.

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TABLE 22 | Teachers' and Students' Reports on the Frequency of Mathematics Textbook Use

	Grade 4		Grade 8			
	1992		1990		1992	
	Teacher	Student	Teacher	Student	Teacher	Student
About how often do students do problems from textbooks?	Percentage and Proficiency		Percentage and Proficiency		Percentage and Proficiency	
Almost every day						
Pennsylvania	83 (2.5) 225 (1.5)	71 (1.4) 227 (1.5)	74 (2.9) 272 (1.7)	75 (1.7) 270 (1.5)	86 (2.0) > 273 (1.6)	85 (1.6) > 274 (1.4)
Northeast	73 (5.6) 220 (2.7)	65 (4.1) 224 (2.4)	57 (9.3) 277 (4.7)	72 (5.3) 276 (3.8)	80 (2.7) 271 (4.2)	81 (2.1) 272 (3.2)
Nation	75 (2.4) 216 (1.1)	65 (1.4) 219 (0.9)	62 (3.4) 267 (1.8)	74 (1.9) 267 (1.3)	82 (1.6) > 271 (1.3)	84 (1.0) > 270 (1.1)
At least once a week						
Pennsylvania	15 (2.4) 215 (3.7)	17 (1.2) 219 (2.5)	24 (2.9) 254 (3.0)	22 (1.5) 256 (2.4)	12 (1.9) < 258 (4.5)	10 (1.1) < 255 (3.0)
Northeast	20 (4.1) 217 (6.9)!	17 (2.6) 227 (3.0)	38 (10.2) 262 (6.6)!	21 (2.7) 256 (5.0)	13 (2.2) < 253 (4.5)	12 (1.3) < 254 (4.7)
Nation	21 (2.0) 219 (2.8)	17 (1.0) 220 (1.7)	34 (3.2) 255 (3.0)	20 (1.2) 249 (1.8)	15 (1.6) < 256 (2.4)	11 (0.8) < 251 (1.9)
Less than weekly						
Pennsylvania	2 (0.8) 191 (6.1)!	12 (1.2) 209 (2.5)	2 (0.5) *** (**.*)	4 (0.5) 259 (6.6)	2 (0.7) *** (**.*)	5 (1.0) 250 (4.8)
Northeast	7 (4.4) *** (**.*)	18 (2.3) 214 (5.6)	5 (4.0) *** (**.*)	7 (2.9) *** (**.*)	8 (2.7) 255 (8.6)!	7 (1.2) 243 (5.8)
Nation	4 (1.4) 227 (4.1)!	18 (1.0) 208 (1.8)	4 (1.3) *** (**.*)	6 (1.0) 241 (6.0)	3 (0.7) 248 (6.0)!	5 (0.4) 245 (2.6)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

Next, examining the frequency of worksheet usage, according to the students' mathematics teachers (Table 23 and Table A23A [Page 188] in the Data Appendix):

- About half of the fourth-grade students and relatively few of the eighth-grade students (52 percent and 10 percent, respectively) did problems from worksheets almost every day; relatively few in grade 4 and less than half in grade 8 did worksheet problems less than weekly (9 percent and 32 percent, respectively).

- In grade 4, worksheets were used almost every day by 64 percent of students attending schools in advantaged urban areas, 30 percent of students in disadvantaged urban areas, 66 percent of students in extreme rural areas, and 55 percent of students in areas classified as "other". For grade 8, these percentages were 0 percent of students in advantaged urban areas, 14 percent of students in disadvantaged urban areas, 8 percent of students in extreme rural areas, and 7 percent of students in areas classified as "other".

- Comparing eighth-grade students' mathematics teachers' responses in 1990 with 1992, about the same percentage of students in 1992 (10 percent) as in 1990 (12 percent) used worksheets almost every day.

And, according to the students (Table 23 and Table A23B [Page [illegible]] in the Data Appendix):

- About half of the fourth-grade students and about one quarter of the eighth-grade students (52 percent and 24 percent, respectively) did problems from worksheets almost every day; some in grade 4 and less than half in grade 8 did worksheet problems less than weekly (15 percent and 34 percent, respectively).

- In grade 4, worksheets were used almost every day by 52 percent of students in advantaged urban areas, 49 percent of students in disadvantaged urban areas, 54 percent of students in extreme rural areas, and 52 percent of students in areas classified as "other". These figures for grade 8 were 22 percent of students in advantaged urban areas, 30 percent of students in disadvantaged urban areas, 13 percent of students in extreme rural areas, and 23 percent of students in areas classified as "other".

- Comparing eighth-grade students' responses in 1990 with 1992, a greater percentage of students in 1992 (24 percent) than in 1990 (18 percent) used worksheets almost every day.

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TABLE 23 | Teachers' and Students' Reports on the Frequency of Mathematics Worksheet Use

	Grade 4		Grade 8			
	1992		1990		1992	
	Teacher	Student	Teacher	Student	Teacher	Student
About how often do students do problems on worksheets?	**Percentage and Proficiency**		**Percentage and Proficiency**		**Percentage and Proficiency**	
Almost every day						
Pennsylvania	52 (3.9) 225 (1.8)	52 (2.2) 223 (1.7)	12 (2.1) 259 (5.3)	18 (1.7) 257 (3.0)	10 (2.1) 253 (4.8)!	24 (2.0) > 260 (2.6)
Northeast	27 (4.8) 218 (5.4)	47 (4.4) 225 (2.7)	7 (5.2) *** (**.*)	21 (4.3) 254 (4.1)!	13 (5.4) 271 (13.1)!	25 (4.3) 260 (7.1)
Nation	26 (2.3) 218 (2.0)	45 (1.4) 218 (1.2)	5 (1.7) 264 (5.3)!	17 (1.7) 247 (2.9)	12 (1.9) > 259 (4.9)	22 (1.4) 256 (2.5)
At least once a week						
Pennsylvania	39 (3.4) 221 (2.4)	34 (1.4) 224 (1.7)	64 (3.2) 267 (2.1)	47 (2.0) 267 (2.0)	58 (2.9) 271 (1.6)	42 (1.8) 271 (1.7)
Northeast	56 (4.0) 222 (3.6)	34 (2.5) 222 (2.6)	78 (6.7) 265 (3.1)	45 (3.1) 268 (2.9)	50 (5.0) < 264 (5.1)	36 (2.3) 266 (4.3)
Nation	58 (2.4) 217 (1.6)	37 (0.9) 219 (1.1)	63 (3.5) 257 (1.8)	46 (1.8) 260 (1.4)	54 (2.2) 266 (1.6) >	42 (1.2) 266 (1.4) >
Less than weekly						
Pennsylvania	9 (1.7) 220 (5.4)!	15 (1.5) 222 (2.9)	25 (3.3) 272 (3.6)	35 (2.4) 271 (2.3)	32 (2.9) 277 (2.9)	34 (2.2) 278 (2.1)
Northeast	17 (3.4) 220 (4.9)!	19 (2.7) 219 (3.3)	15 (4.6) *** (**.*)	34 (6.5) 282 (4.5)!	38 (6.7) > 272 (3.7)	39 (3.7) 276 (3.0)
Nation	16 (2.0) 215 (2.1)	18 (1.0) 215 (1.5)	32 (3.6) 274 (2.7)	37 (2.5) 272 (1.8)	35 (2.7) 273 (1.9)	36 (1.7) 273 (1.3)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

SUMMARY

An inspection of the availability and use of resources for mathematics education can provide insight into how and what students are learning in mathematics. It appears that mathematics textbooks and worksheets continue to play a major role in mathematics teaching. Although constant use of textbooks and worksheets does not preclude effective instruction, and NAEP data cannot establish the quality of instruction accompanying the use of materials, excessive reliance on textbooks and workbooks does indicate less attention to various student-centered strategies.[33]

According to the students' mathematics teachers:

- More than half of the fourth-grade students in Pennsylvania (59 percent) and less than half of the eighth-grade students (41 percent) worked mathematics problems in small groups at least weekly; some in grade 4 and about one quarter in grade 8 never or hardly ever worked mathematics problems in small groups (12 percent and 21 percent, respectively).

- In Pennsylvania, some of the fourth-grade students and about half of the eighth-grade students (14 percent and 50 percent, respectively) never or hardly ever used mathematical objects; 33 percent at grade 4 and 6 percent at grade 8 used these objects at least weekly.

- In Pennsylvania, 83 percent of the fourth-grade students and 86 percent of the eighth-grade students were assigned problems from a mathematics textbook almost every day; 2 percent and 2 percent in fourth and eighth grade, respectively, worked textbook problems less than weekly.

- About half of the fourth-grade students and relatively few of the eighth-grade students (52 percent and 10 percent, respectively) did problems from worksheets almost every day; relatively few in grade 4 and less than half in grade 8 did worksheet problems less than weekly (9 percent and 32 percent, respectively).

And, according to the students:

- In Pennsylvania, 38 percent of the fourth-grade students and 32 percent of the eighth-grade students worked mathematics problems in small groups at least weekly; 43 percent in grade 4 and 41 percent in grade 8 reported never or hardly ever working mathematics problems in small groups.

- In Pennsylvania, less than half of the fourth-grade students and more than half of the eighth-grade students (36 percent and 60 percent, respectively) never or hardly ever used mathematical objects; 34 percent at grade 4 and 16 percent at grade 8 used these objects at least weekly.

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[33] Ina V.S. Mullis, John A. Dossey, Eugene H. Owen, and Gary W. Phillips. *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States.* (Washington, DC: National Center for Education Statistics, 1991).

- In Pennsylvania, 71 percent of the fourth-grade students and 85 percent of the eighth-grade students were assigned problems from a mathematics textbook almost every day; 12 percent and 5 percent in fourth and eighth grade, respectively, worked textbook problems less than weekly.

- About half of the fourth-grade students and about one quarter of the eighth-grade students (52 percent and 24 percent, respectively) did problems from worksheets almost every day; some in grade 4 and less than half in grade 8 did worksheet problems less than weekly (15 percent and 34 percent, respectively).

CHAPTER 5

How Are Calculators and Computers Used?

Recommendations for improving mathematics education often include more use of calculators and computers.[34] The NCTM initiatives describe the benefits provided by calculators and computers to replace hand calculations and suggest that these instruments provide a basis for more complex problem-solving situations that engage students in mathematics learning.

Consistent with the importance of using technology in mathematics instruction, NAEP provided four-function calculators to fourth graders and scientific calculators to eighth graders for portions of the Trial State Assessment and conducted brief training exercises in their use prior to the assessment. Information was collected about students' understanding of when to use a calculator as well as measuring whether they knew how to use a calculator. Additionally, students, teachers, and administrators were asked whether calculators and computers were available in school and how frequently they were used.

ACCESS TO AND USE OF CALCULATORS

Table 24 provides a profile of Pennsylvania fourth- and eighth-grade public schools' policies with regard to calculator use:

- In relation to 5 percent of fourth graders and 49 percent of eighth graders across the nation, 4 percent of the fourth-grade students and 42 percent of the eighth-grade students in Pennsylvania had teachers who allowed calculators to be used for tests. Comparing eighth-grade responses in 1990 and 1992, the percentage of eighth-grade students in Pennsylvania who had teachers who allowed calculators to be used for tests increased from 1990 to 1992 (20 percent in 1990 and 42 percent in 1992).

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[34] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989); *Professional Standards for Teaching Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1991); *Everybody Counts: A Report to the Nation on the Future of Mathematics Education*, Lynn Steen, Ed. (Washington, DC: National Research Council, National Academy Press, 1989).

- In fourth grade, about the same percentage of students in Pennsylvania (4 percent) as in the nation (5 percent) had teachers who permitted unrestricted use of calculators. Similarly, in eighth grade, about the same percentage of students in Pennsylvania (25 percent) as in the nation (30 percent) had teachers who permitted unrestricted use of calculators. In 1990, the percentage of eighth-grade students who had teachers who allowed unrestricted use of calculators was 13 percent in Pennsylvania and 18 percent in the nation.

- More than half of fourth graders in Pennsylvania (69 percent) and more than half in the nation (62 percent) were in schools in which they were given access to calculators owned by the school. In addition, 64 percent of fourth graders in Pennsylvania and 66 percent in the nation had mathematics teachers who reported providing instruction to students in the use of calculators.

- In Pennsylvania, 64 percent of eighth-grade students were in schools in which they were given access to four-function calculators and 31 percent were in schools in which they were given access to scientific calculators. Across the nation, these figures were 66 percent for four-function calculators and 37 percent for scientific calculators. In addition, in Pennsylvania, 58 percent of eighth graders had mathematics teachers who reported providing instruction to students in the use of four-function calculators and 26 percent had teachers who reported providing instruction about scientific calculators. Nationally, these figures were 64 percent and 37 percent of the eighth-grade students, respectively.

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TABLE 24 | Teachers' Reports on Policies about Calculator Use

	Grade 4	Grade 8	
	1992	1990	1992
	Percentage	**Percentage**	**Percentage**
Percentage of students in public schools whose teachers permit the ***use of calculators on tests***			
Pennsylvania	4 (1.5)	20 (3.2)	42 (3.8) >
Northeast	9 (4.0)	14 (9.2)	46 (6.8) >
Nation	5 (1.2)	33 (4.5)	49 (3.1) >
Percentage of students in public schools whose teachers permit the ***unrestricted use of calculators***			
Pennsylvania	4 (1.3)	13 (2.7)	25 (3.4) >
Northeast	10 (4.3)	20 (11.8)	24 (4.0)
Nation	5 (1.2)	18 (3.4)	30 (2.5) >
Percentage of students in public schools whose teachers report that students have ***access to calculators owned by the school***			
Pennsylvania	69 (4.0)	54 (4.0)	--- (--.-)
Northeast	63 (7.0)	28 (8.2)	--- (--.-)
Nation	62 (3.2)	56 (4.6)	--- (--.-)
Percentage of eighth-grade students in public schools whose teachers report that students have ***access to four-function calculators owned by the school***			
Pennsylvania	--- (--.-)	--- (--.-)	64 (3.5)
Northeast	--- (--.-)	--- (--.-)	69 (7.5)
Nation	--- (--.-)	--- (--.-)	66 (3.4)
Percentage of eighth-grade students in public schools whose teachers report that students have ***access to scientific calculators owned by the school***			
Pennsylvania	--- (--.-)	--- (--.-)	31 (4.1)
Northeast	--- (--.-)	--- (--.-)	40 (9.8)
Nation	--- (--.-)	--- (--.-)	37 (3.3)
Percentage of fourth-grade students in public schools whose teachers ***provide instruction in the use of calculators***			
Pennsylvania	64 (4.1)	--- (--.-)	--- (--.-)
Northeast	54 (6.3)	--- (--.-)	--- (--.-)
Nation	66 (2.9)	--- (--.-)	--- (--.-)
Percentage of eighth-grade students in public schools whose teachers ***provide instruction in the use of four-function calculators***			
Pennsylvania	--- (--.-)	--- (--.-)	58 (3.5)
Northeast	--- (--.-)	--- (--.-)	66 (4.2)
Nation	--- (--.-)	--- (--.-)	64 (2.4)
Percentage of eighth-grade students in public schools whose teachers ***provide instruction in the use of scientific calculators***			
Pennsylvania	--- (--.-)	--- (--.-)	26 (3.6)
Northeast	--- (--.-)	--- (--.-)	32 (8.1)
Nation	--- (--.-)	--- (--.-)	37 (3.3)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. --- Item not asked at this grade level in this year.

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Both students and their mathematics teachers were also asked about the frequency of the use of calculators in mathematics class. From Table 25:

- According to the students' mathematics teachers, 18 percent of the fourth-grade students and 46 percent of the eighth-grade students used calculators at least weekly in mathematics class. By comparison, 48 percent and 30 percent in fourth and eighth grade, respectively, never or hardly ever used a calculator. In 1990, 28 percent of the eighth-grade students had mathematics teachers who reported that they used calculators at least weekly and 36 percent had mathematics teachers who reported that they never or hardly ever used calculators.

- According to the students, 28 percent of the fourth graders and 42 percent of the eighth graders used calculators at least weekly in mathematics class. By comparison, 48 percent and 38 percent in fourth and eighth grade, respectively, never or hardly ever used a calculator. In 1990, 26 percent of the eighth-grade students used calculators at least weekly and 52 percent never or hardly ever used calculators.

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TABLE 25

Teachers' and Students' Reports on the Frequency of Calculator Use

	Grade 4		Grade 8			
	1992		1990		1992	
	Teacher	Student	Teacher	Student	Teacher	Student
About how often do students use a calculator?	Percentage and Proficiency		Percentage and Proficiency		Percentage and Proficiency	
At least weekly						
Pennsylvania	18 (3.2) 232 (2.9)	28 (2.0) 220 (2.4)	28 (3.5) 271 (2.6)	26 (2.4) 267 (2.2)	46 (4.2) > 276 (2.2)	42 (3.0) > 274 (2.1)
Northeast	22 (4.8) 225 (5.5)!	23 (2.0) 222 (4.2)	23 (12.6) 281 (12.5)!	23 (6.8) 271 (12.2)!	55 (6.5) 272 (3.8)	45 (4.1) > 272 (4.0)
Nation	18 (2.3) 222 (3.1)	22 (1.2) 215 (1.9)	43 (4.6) 269 (2.9)	40 (3.1) 266 (2.3)	56 (3.0) 274 (1.5)	53 (2.1) > 272 (1.4)
Less than once a week						
Pennsylvania	34 (3.7) 227 (2.1)	24 (1.5) 230 (2.2)	36 (3.2) 267 (2.8)	22 (1.3) 273 (2.0)	24 (2.9) < 267 (2.7)	20 (1.3) 270 (2.4)
Northeast	21 (4.7) 220 (7.5)!	25 (3.3) 232 (3.4)	42 (11.0) 263 (7.4)!	18 (1.7) 274 (3.9)	22 (4.6) 264 (5.9)!	20 (2.4) 266 (3.6)
Nation	34 (2.1) 220 (1.6)	21 (1.4) 227 (1.2)	38 (4.3) 258 (2.3)	21 (1.4) 264 (2.0)	21 (2.2) < 257 (2.3)	18 (0.9) 263 (1.6)
Never or hardly ever						
Pennsylvania	48 (3.8) 217 (2.0)	48 (2.5) 222 (1.5)	36 (4.1) 265 (2.2)	52 (2.6) 264 (2.2)	30 (3.4) 267 (2.6)	38 (2.7) < 268 (1.9)
Northeast	57 (6.6) 218 (3.7)	52 (3.8) 220 (2.6)	35 (13.3) 272 (5.1)!	58 (7.3) 268 (3.0)	23 (3.9) 260 (6.3)	35 (2.6) < 264 (5.2)
Nation	48 (2.9) 213 (1.5)	57 (1.9) 215 (1.0)	18 (4.0) 258 (4.6)!	39 (3.1) 257 (1.4)	23 (2.5) 263 (2.2)	29 (1.6) < 259 (1.6)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic.

THE AVAILABILITY OF COMPUTERS

Computers can be used in a wide variety of ways in mathematics classrooms. Although they may be most frequently used for computational drill and practice, teachers can take full advantage of this technology by using computers to teach graphs, spreadsheets, and extended investigations of mathematical ideas.[35] The computer has the potential to provide opportunities for problem solving using "hands-on" techniques and also can be effective as a tool in small-group work.

NAEP asked students and teachers in public schools about the availability and use of computers in mathematics instruction. As shown in Table 26:

- Less than half of the fourth-grade students (34 percent) and some of the eighth-grade students (14 percent) had teachers who reported that computers were available in the classroom. The percentage of eighth-grade students in Pennsylvania who had teachers who reported that computers were available in the classroom stayed about the same from 1990 to 1992 (15 percent in 1990 and 14 percent in 1992).

- In Pennsylvania, 39 percent of the fourth-grade students and 25 percent of the eighth-grade students had teachers who reported that the primary use of these computers was drill and practice. In addition, 7 percent of the fourth-grade students and 8 percent of the eighth-grade students had teachers who reported that the primary use was learning new topics in mathematics.

And, from Table 27:

- According to the students' mathematics teachers, 42 percent of the fourth-grade students and 5 percent of the eighth-grade students used computers at least weekly in mathematics class. By comparison, 32 percent and 74 percent in fourth and eighth grade, respectively, never or hardly ever used a computer. In 1990, 5 percent of the eighth-grade students had mathematics teachers who reported that they used computers at least weekly and 55 percent had mathematics teachers who reported that they never or hardly ever used computers.

- According to the students, 31 percent of the fourth graders and 12 percent of the eighth graders used computers at least weekly in mathematics class. By comparison, 57 percent and 76 percent in fourth and eighth grade, respectively, never or hardly ever used a computer. In 1990, 11 percent of the eighth-grade students used computers at least weekly and 75 percent never or hardly ever used computers.

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[35] Mary Male, "Cooperative Learning and Computers in the Elementary and Middle School Math Classroom," in *Cooperative Learning in Mathematics*, Neil Davidson, Ed. (Menlo Park, CA: Addison-Wesley Publishing Company, 1990); Charlene Sheets and M. Kathleen Heid, "Integrating Computers as Tools in Mathematics Curricula (Grades 9-13): Portraits of Group Interactions," in *Cooperative Learning in Mathematics*, Neil Davidson, Ed. (Menlo Park, CA: Addison-Wesley Publishing Company, 1990).

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TABLE 26

Teachers' Reports on the Availability and Primary Use of Computers in Mathematics Classrooms

	Grade 4	Grade 8	
	1992	1990	1992
Availability of Computers	**Percentage**	**Percentage**	**Percentage**
Not available			
Pennsylvania	19 (3.3)	24 (3.1)	29 (3.6)
Northeast	19 (6.1)	21 (8.3)	18 (4.2)
Nation	17 (2.7)	28 (4.2)	24 (2.2)
Available but difficult to access			
Pennsylvania	47 (3.6)	60 (3.9)	57 (4.1)
Northeast	32 (4.6)	67 (11.3)	64 (6.1)
Nation	38 (2.8)	50 (4.7)	56 (3.0)
Available within the classroom			
Pennsylvania	34 (3.5)	15 (2.8)	14 (2.6)
Northeast	48 (7.3)	12 (9.1)	19 (5.2)
Nation	45 (3.0)	22 (4.0)	19 (2.2)
Primary Use of Computers			
Drill and practice			
Pennsylvania	39 (4.0)	--- (--.-)	25 (3.5)
Northeast	27 (5.9)	--- (--.-)	16 (5.7)
Nation	33 (2.8)	--- (--.-)	22 (2.6)
Learning new topics in mathematics			
Pennsylvania	7 (2.2)	--- (--.-)	8 (2.2)
Northeast	3 (1.9)	--- (--.-)	7 (3.3)
Nation	3 (0.8)	--- (--.-)	8 (1.4)
Playing mathematical learning games			
Pennsylvania	24 (3.0)	--- (--.-)	--- (--.-)
Northeast	35 (4.9)	--- (--.-)	--- (--.-)
Nation	40 (2.6)	--- (--.-)	--- (--.-)
Displaying and interpreting data			
Pennsylvania	--- (--.-)	--- (--.-)	5 (1.3)
Northeast	--- (--.-)	--- (--.-)	5 (2.0)
Nation	--- (--.-)	--- (--.-)	9 (1.6)
I do not use computers			
Pennsylvania	29 (4.0)	--- (--.-)	61 (4.3)
Northeast	35 (7.3)	--- (--.-)	71 (4.8)
Nation	25 (3.0)	--- (--.-)	61 (2.8)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. --- Item not asked at this grade level in this year.

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TABLE 27 | Teachers' and Students' Reports on the Frequency of Computer Use in Mathematics Classrooms

	Grade 4		Grade 8			
	1992		1990		1992	
	Teacher	Student	Teacher	Student	Teacher	Student
About how often do students use a computer?	Percentage and Proficiency		Percentage and Proficiency		Percentage and Proficiency	
At least weekly						
Pennsylvania	42 (4.1) 224 (2.2)	31 (2.2) 222 (2.0)	5 (1.4) 259 (11.2)!	11 (1.1) 257 (3.8)	5 (1.4) 259 (5.7)!	12 (1.1) 262 (3.3)
Northeast	43 (8.9) 223 (4.1)!	26 (2.2) 218 (2.7)	10 (6.4) *** (**.*)	18 (3.1) 258 (5.4)	9 (2.5) 240 (7.3)!	17 (1.6) 250 (3.5)
Nation	55 (3.3) 218 (1.5)	33 (1.2) 214 (1.1)	12 (3.5) 246 (5.2)!	15 (1.2) 248 (2.4)	8 (1.3) 252 (3.9)	15 (0.9) 254 (1.9)
Less than once a week						
Pennsylvania	26 (3.3) 226 (2.5)	12 (0.8) 230 (2.2)	40 (4.0) 269 (2.0)	14 (1.6) 270 (2.3)	21 (3.6) < 277 (3.1)	12 (1.3) 272 (3.0)
Northeast	25 (6.9) 221 (5.7)!	10 (1.4) 232 (4.6)	27 (8.4) 265 (8.4)!	14 (2.0) 271 (4.4)	11 (2.8) 266 (6.9)!	10 (1.2) 264 (5.6)
Nation	20 (2.2) 218 (2.8)	9 (0.6) 227 (1.8)	34 (4.5) 264 (3.1)	14 (1.3) 266 (2.8)	18 (2.1) < 268 (2.3)	12 (0.8) 270 (2.2)
Never or hardly ever						
Pennsylvania	32 (4.2) 220 (3.3)	57 (2.2) 224 (1.5)	55 (4.3) 266 (2.7)	75 (2.1) 268 (1.8)	74 (4.2) > 270 (1.6)	76 (1.6) 272 (1.4)
Northeast	32 (7.8) 217 (5.3)!	64 (3.1) 224 (2.6)	63 (6.3) 274 (4.0)	68 (3.0) 273 (4.1)	80 (3.7) 271 (3.9)	73 (2.4) 273 (3.4)
Nation	24 (2.9) 214 (2.5)	58 (1.4) 218 (1.0)	54 (4.2) 266 (2.2)	70 (1.6) 264 (1.4)	74 (2.1) > 270 (1.4)	73 (1.3) 269 (1.0) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

WHEN TO USE A CALCULATOR

Part of the Trial State Assessment was designed to investigate whether students know when the use of a calculator is helpful and when it is not. In 1992, there were 13 sections of mathematics questions in the assessment at each grade level. For three of the 13 sections at grades 4 and 8, students were given calculators to use. The test administrator provided the students with instructions and practice on how to use the calculator prior to the assessment. During the assessment, students were allowed to choose whether or not to use the calculator for each item in the calculator sections, and they were asked to indicate in their test booklets whether they did or did not use it for each item. Because of the sampling methodology used for the Trial State Assessment, not every student took all of the calculator sections. Some took two calculator sections, some took one section, and some took none. Certain items in the calculator sections were defined as "calculator-suitable" items -- that is, items for which the calculator was useful but not required to determine the correct response. The remainder of the items were "calculator-unsuitable" items -- items for which the use of the calculator was inappropriate. In total, at fourth grade there were 26 calculator-suitable items and 11 calculator-unsuitable items across the three sections; at eighth grade, there were 23 calculator-suitable items and 12 calculator-unsuitable items across the three sections.

To examine the characteristics of students who generally knew when the use of the calculator was helpful and those who did not, the students who responded to one or two of the calculator sections were categorized into two groups:

- **High** -- students who used the calculator for at least 65 percent of the calculator-suitable items and used the calculator for no more than one of the calculator-unsuitable items.
- **Other** -- students who used the calculator for less than 65 percent of the calculator-suitable items or used it for more than one of the calculator-unsuitable items.

Thus, students in the "High" group used the calculator frequently *and* appropriately. Students in the "Other" group used the calculator less frequently *or* inappropriately. The data presented in Table 28 and Table A28 (Page 200) in the Data Appendix indicate that:

- A smaller percentage of fourth-grade students in Pennsylvania were in the High group (25 percent) than were in the Other group (75 percent); a smaller percentage of eighth-grade students in Pennsylvania were in the High group (27 percent) than were in the Other group (73 percent).
- At fourth grade, a greater percentage of females than males were in the High group (29 percent of females and 22 percent of males). At eighth grade, a greater percentage of females than males were in the High group (32 percent of females and 22 percent of males).
- At fourth grade, 27 percent of White students, 23 percent of Black students, and 22 percent of Hispanic students were in the High group.
- At eighth grade, 29 percent of White students, 15 percent of Black students, and 18 percent of Hispanic students were in the High group.

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TABLE 28 | Students' Knowledge of Using Calculators

"Calculator-Use" Group	1992 Grade 4 Percentage and Proficiency	1992 Grade 8 Percentage and Proficiency
High		
Pennsylvania	25 (1.4) 223 (1.8)	27 (1.5) 283 (2.1)
Northeast	24 (2.8) 220 (4.2)	22 (1.4) 283 (2.9)
Nation	23 (0.9) 217 (1.7)	26 (0.9) 280 (1.6)
Other		
Pennsylvania	75 (1.4) 223 (1.6)	73 (1.5) 265 (1.8)
Northeast	76 (2.8) 223 (2.1)	78 (1.4) 261 (2.9)
Nation	77 (0.9) 217 (1.0)	74 (0.9) 260 (1.1)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). Comparisons to 1990 are not appropriate because of the changing nature of the calculator-suitable and calculator-unsuitable items and the changing nature of the definitions of the "High" and "Other" groups from 1990 to 1992. Students in the "High" group used the calculator for at least 65 percent of the calculator-suitable items and used the calculator for no more than one of the calculator-unsuitable items. Students in the "Other" group used the calculator for less than 65 percent of the calculator-suitable items or used it for more than one of the calculator-unsuitable items.

SUMMARY

NCTM recommends that:[36]

- Appropriate calculators (i.e., scientific calculators for middle school and scientific graphing calculators for high school) should be available to all students at all times.
- A computer should be available in every classroom for demonstration purposes.
- Every student should have access to a computer for individual and group work.
- Students should learn to use the computer as a tool for processing information and performing calculations to investigate and solve problems.

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[36] *Curriculum and Evaluation Standards for School Mathematics* (Reston, Va: National Council of Teachers of Mathematics, 1989); *Professional Standards for Teaching Mathematics* (Reston, Va: National Council of Teachers of Mathematics, 1991).

The data related to calculators and computers and their use show that:

- In fourth grade, about the same percentage of students in Pennsylvania (4 percent) as in the nation (5 percent) had teachers who permitted unrestricted use of calculators. Similarly, in eighth grade, about the same percentage of students in Pennsylvania (25 percent) as in the nation (30 percent) had teachers who permitted unrestricted use of calculators.

- In Pennsylvania, 64 percent of eighth-grade students were in schools in which they were given access to four-function calculators and 31 percent were in schools in which they were given access to scientific calculators. Across the nation, these figures were 66 percent for four-function calculators and 37 percent for scientific calculators. In addition, in Pennsylvania, 58 percent of eighth graders had mathematics teachers who reported providing instruction to students in the use of four-function calculators and 26 percent had teachers who reported providing instruction about scientific calculators. Nationally, these figures were 64 percent and 37 percent of the eighth-grade students, respectively.

- According to the students' mathematics teachers, 18 percent of the fourth-grade students and 46 percent of the eighth-grade students used calculators at least weekly in mathematics class. By comparison, 48 percent and 30 percent in fourth and eighth grade, respectively, never or hardly ever used a calculator. In 1990, 28 percent of the eighth-grade students had mathematics teachers who reported that they used calculators at least weekly and 36 percent had mathematics teachers who reported that they never or hardly ever used calculators.

- According to the students, 28 percent of the fourth graders and 42 percent of the eighth graders used calculators at least weekly in mathematics class. By comparison, 48 percent and 38 percent in fourth and eighth grade, respectively, never or hardly ever used a calculator. In 1990, 26 percent of the eighth-grade students used calculators at least weekly and 52 percent never or hardly ever used calculators.

- Less than half of the fourth-grade students (34 percent) and some of the eighth-grade students (14 percent) had teachers who reported that computers were available in the classroom. The percentage of eighth-grade students in Pennsylvania who had teachers who reported that computers were available in the classroom stayed about the same from 1990 to 1992 (15 percent in 1990 and 14 percent in 1992).

- In Pennsylvania, 39 percent of the fourth-grade students and 25 percent of the eighth-grade students had teachers who reported that the primary use of these computers was drill and practice. By comparison, 7 percent of the fourth-grade students and 8 percent of the eighth-grade students had teachers who reported that the primary use was learning new topics in mathematics.

CHAPTER 6

Who Is Teaching Fourth-Grade and Eighth-Grade Mathematics?

Teachers have a vital function in improving students' mathematics learning. Thus, it is of interest to examine the educational background, experience, and certification of the teachers who are teaching fourth- and eighth-grade mathematics in public schools. As shown in Table 29:

- In Pennsylvania, 57 percent of the fourth-grade students and 50 percent of the eighth-grade students were being taught by mathematics teachers who reported having at least a master's or education specialist's degree. Across the nation, these figures were 47 percent and 47 percent for fourth- and eighth-grade students, respectively.

- About three quarters of the students in fourth grade (74 percent) and about three quarters in eighth grade (77 percent) had mathematics teachers who had the highest level of teaching certification available. Across the nation, 57 percent of the fourth-graders and 63 percent of the eighth-graders were taught by mathematics teachers who were certified at the highest level available in their states.

- Relatively few of the fourth-grade students (5 percent) and almost all of the eighth-grade students (91 percent) in Pennsylvania had mathematics teachers who had a mathematics (middle/junior high or secondary school) teaching certificate. Across the nation, 10 percent in grade 4 and 79 percent in grade 8 had teachers with such certification.

- In 1990, 47 percent of the eighth-grade students were being taught by mathematics teachers who reported having at least a master's or education specialist's degree, 80 percent were taught by teachers who had the highest level of teacher certification available in Pennsylvania, and 89 percent by teachers who had a mathematics (middle/junior high or secondary school) teaching certificate. As indicated above, in 1992, the comparable figures were 50 percent, 77 percent, and 91 percent, respectively.

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TABLE 29

Profile of Fourth-Grade and Eighth-Grade Public-School Mathematics Teachers

	Grade 4	Grade 8	
	1992	1990	1992
Percentage of students whose mathematics teachers reported having the following degrees	**Percentage**	**Percentage**	**Percentage**
Bachelor's degree			
Pennsylvania	43 (3.2)	53 (3.6)	50 (3.2)
Northeast	40 (6.1)	46 (15.0)	37 (5.5)
Nation	53 (2.4)	56 (4.2)	53 (2.9)
Master's or specialist's degree			
Pennsylvania	56 (3.1)	45 (3.5)	49 (3.1)
Northeast	58 (5.9)	54 (15.0)	62 (5.4)
Nation	47 (2.4)	42 (4.2)	46 (2.9)
Doctorate or professional degree			
Pennsylvania	1 (0.5)	1 (0.7)	1 (0.7)
Northeast	2 (1.5)	0 (0.0)	1 (0.6)
Nation	0 (0.3)	2 (1.4)	0 (0.3)
Percentage of students whose mathematics teachers reported having the following types of teaching certificates that are recognized by Pennsylvania			
No regular certification			
Pennsylvania	4 (1.3)	7 (2.2)	3 (1.2)
Northeast	5 (2.2)	0 (0.0)	3 (1.2)
Nation	7 (1.2)	4 (1.2)	4 (1.0)
Regular certification but less than the highest available			
Pennsylvania	21 (2.7)	14 (2.7)	20 (3.3)
Northeast	26 (5.3)	19 (11.5)	19 (4.0)
Nation	36 (2.6)	29 (4.3)	*33 (2.4)
Highest certification available (permanent or long-term)			
Pennsylvania	74 (2.9)	80 (3.2)	77 (3.4)
Northeast	69 (5.1)	81 (11.5)	78 (4.1)
Nation	57 (2.5)	66 (4.3)	63 (2.4)
Percentage of students whose mathematics teachers reported having teaching certification in the following areas that are recognized by Pennsylvania			
Mathematics (middle school or secondary)			
Pennsylvania	5 (1.0)	89 (2.8)	91 (1.8)
Northeast	1 (0.4)	89 (3.7)	75 (6.8)
Nation	10 (1.6)	84 (2.2)	79 (2.7)
Education (elementary or middle school)			
Pennsylvania	93 (1.4)	9 (2.7)	7 (1.6)
Northeast	95 (1.8)	8 (3.8)	24 (6.8)
Nation	87 (1.8)	12 (2.6)	18 (2.6)
Other			
Pennsylvania	3 (0.9)	2 (0.8)	2 (0.8)
Northeast	4 (1.8)	4 (3.7)	1 (0.6)
Nation	4 (0.8)	4 (1.5)	4 (1.2)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

EDUCATIONAL BACKGROUND

Although mathematics teachers are held responsible for providing high-quality instruction to their students, there continues to be concern that many have had limited exposure to some content and concepts in the subject area. The Trial State Assessment gathered details on the teachers' educational backgrounds -- more specifically, their undergraduate and graduate majors and their in-service training. Tables 30 and 31 provide information about the educational background of the students' mathematics teachers.

Summarizing teacher responses to questions concerning their undergraduate and graduate fields of study (Table 30):[37]

- In Pennsylvania, 5 percent of the fourth-grade and 57 percent of the eighth-grade public-school students were being taught mathematics by teachers who had an undergraduate major in mathematics. Across the nation, 5 percent of the fourth-grade students and 45 percent of the eighth-grade students had mathematics teachers with a major in mathematics.

- Relatively few of the fourth-grade and less than half of the eighth-grade students in Pennsylvania (2 percent and 37 percent, respectively) were taught mathematics by teachers who had a graduate major in mathematics. Across the nation, 2 percent and 21 percent of the fourth- and eighth-grade students, respectively, were taught by teachers who majored in mathematics in graduate school.

Summarizing teacher responses to questions concerning their in-service training for the year preceding the Trial State Assessment (Table 31):

- In Pennsylvania, 16 percent of the fourth-grade and 35 percent of the eighth-grade public-school students had teachers who spent at least 16 hours on in-service education dedicated to mathematics or the teaching of mathematics. Across the nation, 21 percent of the fourth-grade students and 47 percent of the eighth-grade students had teachers who spent at least that much time on similar types of in-service training.

- About one quarter of the fourth-grade students and some of the eighth-grade students in Pennsylvania (27 percent and 14 percent, respectively) had mathematics teachers who did not spend any time on in-service education devoted to mathematics or the teaching of mathematics. Nationally, 17 percent of the fourth-grade students and 8 percent of the eighth-grade students had mathematics teachers who did not spend any time on similar in-service training.

- The percentage of eighth-grade students in 1992 with teachers who reported spending at least 16 hours on in-service education dedicated to mathematics or the teaching of mathematics stayed about the same* compared to 1990 (35 percent in 1992 and 27 percent in 1990).

- The percentage of eighth-grade students in 1992 with teachers who reported spending no time on in-service education dedicated to mathematics or the teaching of mathematics stayed about the same compared to 1990 (14 percent in 1992 and 19 percent in 1990).

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* Recall that "about the same" means that the difference between these two groups, although it may appear large, is not statistically significant.

[37] Comparisons of teachers' responses in 1990 and 1992 about their undergraduate and graduate degrees are not possible because of changes in the form of the questions that the teachers were asked.

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TABLE 30

Teachers' Reports on Their Undergraduate and Graduate Fields of Study

	1992 Grade 4	1992 Grade 8
What was your undergraduate major?	**Percentage**	**Percentage**
Mathematics		
Pennsylvania	5 (1.6)	57 (3.8)
Northeast	5 (1.7)	50 (7.0)
Nation	5 (1.0)	45 (2.9)
Mathematics Education		
Pennsylvania	3 (1.2)	29 (3.5)
Northeast	3 (2.0)	12 (2.1)
Nation	2 (0.6)	16 (2.1)
Education		
Pennsylvania	85 (2.5)	10 (2.0)
Northeast	77 (4.6)	29 (7.1)
Nation	82 (1.5)	27 (2.8)
Other		
Pennsylvania	8 (1.6)	4 (1.3)
Northeast	15 (4.6)	9 (1.7)
Nation	11 (1.3)	12 (1.2)
What was your graduate major?		
Mathematics		
Pennsylvania	2 (0.6)	37 (3.0)
Northeast	0 (0.0)	20 (5.3)
Nation	2 (0.7)	21 (2.7)
Mathematics Education		
Pennsylvania	1 (0.4)	26 (3.2)
Northeast	2 (1.9)	24 (4.9)
Nation	3 (0.9)	19 (2.4)
Education		
Pennsylvania	89 (1.8)	25 (2.8)
Northeast	79 (5.4)	44 (9.1)
Nation	82 (2.3)	46 (4.0)
Other or no graduate level of study		
Pennsylvania	8 (1.7)	12 (2.5)
Northeast	19 (5.1)	13 (3.9)
Nation	13 (1.6)	13 (1.9)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). Comparisons of teachers' responses in 1990 and 1992 about their undergraduate and graduate degrees are not possible because of changes in the form of the questions that the teachers were asked.

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TABLE 31 | Teachers' Reports on Their In-Service Training

During the last year, how much time in total have you spent on in-service education in mathematics or the teaching of mathematics?	Grade 4	Grade 8	
	1992	1990	1992
	Percentage	**Percentage**	**Percentage**
None			
Pennsylvania	27 (3.3)	19 (3.3)	14 (2.6)
Northeast	18 (3.9)	25 (7.0)	11 (5.6)
Nation	17 (2.0)	11 (2.1)	8 (1.5)
One to fifteen hours			
Pennsylvania	57 (3.7)	54 (3.9)	51 (3.7)
Northeast	68 (5.9)	37 (4.1)	51 (5.7)
Nation	62 (2.6)	51 (4.1)	45 (2.6)
Sixteen hours or more			
Pennsylvania	16 (2.4)	27 (3.4)	35 (3.4)
Northeast	14 (4.5)	38 (8.4)	38 (5.9)
Nation	21 (2.5)	39 (3.8)	47 (2.6)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

SUMMARY

Results from the 1990 NAEP mathematics assessment have indicated that students' achievement in mathematics is much lower than educators and the public would like it to be.[38] In curriculum areas requiring special attention and improvement, such as mathematics, it is particularly important to have well-qualified teachers. There is no guarantee that individuals with a specific set of credentials will be effective teachers; however, it is likely that relevant training and experience do contribute to better teaching.

The information about public-school teachers' educational backgrounds and experience reveals that:

- In Pennsylvania, 57 percent of the fourth-grade students and 50 percent of the eighth-grade students were being taught by mathematics teachers who reported having at least a master's or education specialist's degree. Across the nation, these figures were 47 percent and 47 percent for fourth- and eighth-grade students, respectively.
- In Pennsylvania, 5 percent of the fourth-grade and 57 percent of the eighth-grade students were being taught mathematics by teachers who had an undergraduate major in mathematics. Across the nation, 5 percent of the fourth-grade students and 45 percent of the eighth-grade students had mathematics teachers with a major in mathematics.

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[38] Ina V.S. Mullis, John A. Dossey, Eugene H. Owen, and Gary W. Phillips. *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States.* (Washington, DC: National Center for Education Statistics, 1991).

- Relatively few of the fourth-grade and less than half of the eighth-grade students in Pennsylvania (2 percent and 37 percent, respectively) were taught mathematics by teachers who had a graduate major in mathematics. Across the nation, 2 percent and 21 percent of the fourth- and eighth-grade students, respectively, were taught by teachers who majored in mathematics in graduate school.

- In Pennsylvania, 16 percent of the fourth-grade and 35 percent of the eighth-grade students had teachers who spent at least 16 hours on in-service education dedicated to mathematics or the teaching of mathematics. Across the nation, 21 percent of the fourth-grade students and 47 percent of the eighth-grade students had teachers who spent at least that much time on similar types of in-service training.

- About one quarter of the fourth-grade students and some of the eighth-grade students in Pennsylvania (27 percent and 14 percent, respectively) had mathematics teachers who did not spend any time on in-service education devoted to mathematics or the teaching of mathematics. Nationally, 17 percent of the fourth-grade students and 8 percent of the eighth-grade students had mathematics teachers who did not spend any time on similar in-service training.

CHAPTER 7

The Conditions Beyond School that Facilitate Mathematics Learning and Teaching

Parents are children's first teachers and should remain instrumental in their children's educational success.[39] Parents can support learning in many ways, including monitoring homework, turning off the television in favor of reading or other literacy-related activities, and making sure that students are attending school. To examine the relationship between home environment and mathematics proficiency, students participating in the Trial State Assessment were asked a series of questions about themselves, their parents or guardians, and home factors related to education.

AMOUNT OF READING MATERIALS IN THE HOME

The number and types of reading and reference materials in the home may be an indicator of the value placed by parents on learning and schooling. Public-school students participating in the Trial State Assessment were asked about the availability of newspapers, magazines, books, and an encyclopedia at home. Average mathematics proficiency associated with having zero to two, three, or four of these types of materials in the home is shown in Table 32 and Table A32 (Page 202) in the Data Appendix.

The data for Pennsylvania reveal that:

- Grade 4 students in Pennsylvania who had all four of these types of materials in the home showed a higher mathematics proficiency than did students with zero to two types of materials. This is similar to the results for the grade 8 students in Pennsylvania, where students who had all four types of materials showed a higher mathematics proficiency than did students who had zero to two types.

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[39] Carnegie Council on Adolescent Development. *Turning Points: Preparing American Youth for the 21st Century.* (New York, NY: Carnegie Corporation of New York, 1989); James P. Comer, "Home, School, and Academic Learning," in *Access to Knowledge: An Agenda for Our Our Nation's Schools*, John I. Goodlad and Pamela Keating, Eds. (New York, NY: College Entrance Examination Board, 1990); The Harvard Education Letter, "Parents and Schools." (Cambridge, MA: Harvard University Press, November December 1988).

- In grade 4, 41 percent of White students, 33 percent of Black students, and 22 percent of Hispanic students had all four types of these reading materials in their homes.
- In grade 8, 60 percent of White students, 37 percent of Black students, and 42 percent of Hispanic students had all four types of these reading materials in their homes.
- Compared to 1990, about the same percentage of eighth-grade students in 1992 had all four types of these reading materials in their homes (56 percent in 1990 and 56 percent in 1992).

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TABLE 32

Students' Reports on Types of Reading Materials in the Home

	Grade 4	Grade 8	
	1992	1990	1992
Does your family have, or receive on a regular basis, each of the following items: more than 25 books, an encyclopedia, newspapers, magazines?	**Percentage and Proficiency**	**Percentage and Proficiency**	**Percentage and Proficiency**
Zero to two types			
Pennsylvania	26 (1.1) 213 (1.5)	14 (0.7) 248 (2.6)	15 (1.0) 252 (2.0)
Northeast	26 (2.8) 205 (2.5)	13 (2.0) 253 (4.1)	19 (2.3) 246 (3.6)
Nation	31 (1.3) 206 (1.1)	21 (1.0) 244 (2.1)	21 (0.7) 247 (1.2)
Three types			
Pennsylvania	35 (0.8) 223 (1.8)	30 (1.2) 262 (1.9)	29 (0.8) 266 (1.9)
Northeast	36 (1.9) 224 (2.3)	31 (2.7) 265 (3.1)	32 (1.1) 267 (4.0)
Nation	35 (0.7) 218 (1.0)	30 (1.0) 259 (1.6)	31 (0.7) 266 (1.3) >
Four types			
Pennsylvania	38 (1.3) 230 (1.7)	56 (1.4) 274 (1.6)	56 (1.2) 278 (1.6)
Northeast	38 (2.5) 234 (3.2)	56 (3.7) 277 (4.2)	49 (2.6) 276 (3.1)
Nation	34 (1.2) 227 (1.2)	48 (1.3) 272 (1.5)	48 (1.0) 275 (1.1)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

HOURS OF TELEVISION WATCHED PER DAY

Report after report has chronicled the relationship between television watching and achievement.[40] To provide additional relevant data, public-school students participating in the 1992 Trial State Assessment were asked to report on the amount of television they watched each day (Table 33 and Table A33 [Page 204] in the Data Appendix).

In grade 4:

- Average mathematics proficiency was lowest for students in Pennsylvania who spent six hours or more watching television each day.
- Some of the students in Pennsylvania (19 percent) watched one hour or less of television each day; 18 percent watched six hours or more.
- In Pennsylvania, 13 percent of White students, 43 percent of Black students, and 29 percent of Hispanic students watched six hours or more of television each day.
- By comparison, 21 percent of White students, 11 percent of Black students, and 20 percent of Hispanic students watched an hour or less of television each day.

In grade 8:

- In Pennsylvania, average mathematics proficiency was lowest for students who spent six hours or more watching television each day.
- Some of the students in Pennsylvania (16 percent) watched one hour or less of television each day; 9 percent watched six hours or more. In 1990, 14 percent watched one hour or less of television each day while 10 percent watched six hours or more.
- In Pennsylvania, 6 percent of White students, 29 percent of Black students, and 17 percent of Hispanic students watched six hours or more of television each day.
- In addition, 17 percent of White students, 7 percent of Black students, and 15 percent of Hispanic students watched an hour or less of television each day.
- Compared to 1990, about the same percentage of eighth-grade students in 1992 watched six hours or more of television each day (10 percent in 1990 and 9 percent in 1992). About the same percentage of eighth-grade students in 1992 watched an hour or less of television each day (14 percent in 1990 and 16 percent in 1992).

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[40] Ina V.S. Mullis, John A. Dossey, Eugene H. Owen, and Gary W. Phillips. *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States.* (Washington, DC: National Center for Education Statistics, 1991).

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TABLE 33

Students' Reports on the Amount of Time Spent Watching Television Each Day

How much television do you usually watch each day?	Grade 4	Grade 8	
	1992	1990	1992
	Percentage and Proficiency	**Percentage and Proficiency**	**Percentage and Proficiency**
One hour or less			
Pennsylvania	19 (1.0) 225 (2.4)	14 (0.7) 276 (2.4)	16 (0.9) 280 (2.5)
Northeast	20 (1.9) 229 (3.3)	12 (1.3) 278 (4.5)	15 (1.1) 278 (6.5)
Nation	21 (0.8) 220 (1.6)	12 (0.8) 269 (2.4)	15 (0.6) > 276 (2.2)
Two hours			
Pennsylvania	22 (1.0) 230 (1.5)	24 (1.1) 272 (1.8)	28 (1.1) 277 (1.5)
Northeast	19 (1.3) 230 (3.6)	21 (2.3) 279 (2.9)	22 (1.4) 276 (4.2)
Nation	19 (0.7) 224 (1.5)	21 (0.9) 268 (1.9)	23 (0.8) 276 (1.6) >
Three hours			
Pennsylvania	20 (1.0) 227 (1.8)	26 (1.1) 269 (1.7)	26 (0.9) 273 (1.5)
Northeast	17 (1.8) 230 (4.0)	23 (1.2) 272 (4.1)	21 (1.6) 276 (3.3)
Nation	17 (0.6) 223 (1.4)	22 (0.8) 266 (1.8)	22 (0.6) 270 (1.2)
Four to five hours			
Pennsylvania	21 (0.9) 226 (2.0)	25 (1.0) 262 (1.9)	22 (0.9) < 264 (1.9)
Northeast	22 (2.5) 223 (2.5)	28 (2.6) 267 (4.5)	28 (1.6) 260 (3.2)
Nation	22 (0.6) 219 (1.3)	28 (1.1) 262 (1.6)	26 (0.7) 260 (1.1)
Six hours or more			
Pennsylvania	18 (1.3) 206 (1.8)	10 (0.8) 244 (3.1)	9 (0.8) 246 (3.4)
Northeast	23 (2.6) 204 (3.3)	15 (3.3) 254 (5.5)!	14 (0.8) 241 (3.4)
Nation	22 (0.8) 203 (1.2)	16 (1.0) 245 (2.0)	13 (0.4) 243 (1.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution — the nature of the sample does not allow accurate determination of the variability of this statistic.

STUDENT ABSENTEEISM

Excessive absenteeism may also be an obstacle to students' success in school. To examine the relationship of student absenteeism to mathematics proficiency, the eighth-grade students participating in the Trial State Assessment were asked to report on the number of days of school they missed during the one-month period preceding the assessment.

From Table 34:

- Average mathematics proficiency was highest for eighth-grade students who did not miss any days of school and lowest for eighth-grade students who missed three or more days of school.
- About half of the students in grade 8 (45 percent) did not miss any school days in the month prior to the assessment, while 21 percent in grade 8 missed three days or more.
- In 1990, 41 percent of the eighth-grade students did not miss any school days in the month prior to the assessment, while 24 percent missed three days or more.

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TABLE 34 | Eighth-Grade Students' Reports on the Number of Days of School Missed

How many days of school did you miss last month?	Grade 8 1990 Percentage and Proficiency	 1992 Percentage and Proficiency
None		
Pennsylvania	41 (1.1) 271 (1.6)	45 (1.1) > 277 (1.4) >
Northeast	43 (2.2) 277 (3.5)	38 (2.3) 271 (3.7)
Nation	45 (1.1) 265 (1.7)	42 (1.0) 271 (1.1) >
One or two days		
Pennsylvania	35 (1.1) 270 (1.9)	34 (1.1) 270 (1.8)
Northeast	37 (3.1) 271 (2.6)	35 (2.6) 269 (2.4)
Nation	32 (0.9) 267 (1.5)	34 (0.9) 268 (1.1)
Three days or more		
Pennsylvania	24 (1.0) 254 (2.2)	21 (0.8) 259 (2.3)
Northeast	21 (3.0) 255 (5.1)	27 (1.7) 260 (3.7)
Nation	23 (1.1) 250 (1.8)	23 (0.6) 257 (1.4) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level.

STUDENTS' PERCEPTIONS OF MATHEMATICS

Learning mathematics should require students not only to master essential skills and concepts, but also to develop confidence in their mathematical abilities and to value mathematics as a discipline.[41] Students were asked if they agreed or disagreed with a series of statements designed to elicit their perceptions of mathematics. These included statements about:

- Personal experience with mathematics, including students' enjoyment of mathematics and level of confidence in their mathematical abilities: *I like mathematics; I am good in mathematics.*
- Value of mathematics, including students' perceptions of its present utility and its expected relevance to future work and life requirements: *Almost all people use mathematics in their jobs; Mathematics is not more for boys than for girls.*
- The nature of mathematics, including students' ability to identify the salient features of the discipline: *Mathematics is useful for solving everyday problems.*

A "perception index" was developed to examine students' perceptions of mathematics. For each of the five attitude statements, students who responded "strongly agree" were given a value of 1 (indicating very positive attitudes about the subject), students who responded "agree" were given a value of 2, and students who responded "undecided," "disagree," or "strongly disagree" were given a value of 3.[42] Each student's responses were averaged over the five statements. The students were then assigned a perception index according to whether they tended to strongly agree with the statements (an index of 1); tended to agree with the statements (an index of 2); or tended to be undecided, to disagree, or to strongly disagree (eighth grade only) with the statements (an index of 3).

Table 35 provides the data for public-school students' attitudes toward mathematics as defined by their perception index. The following results were observed for Pennsylvania.

In grade 4:

- Average mathematics proficiency was higher for students who were in the "agree" category than for students who were in the "undecided, disagree" category.
- Many of the students (84 percent) were in the "agree" category (perception index of 2). Across the nation, 80 percent of the students were in this category.
- Some of the students in Pennsylvania (16 percent), versus 20 percent across the nation, were in the "undecided, disagree" category (perception index of 3).

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[41] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989).

[42] In the 1990 Trial State Assessment, students were asked five perception questions while in the 1992 Trial State Assessment, eight perception questions were asked, the five from 1990 plus three new questions. To compare the students' perception indices from 1990 to 1992, the same five statements were used to create the indices for both years. In addition, at the fourth-grade level, students could only respond "agree," "undecided," or "disagree." Thus, for fourth grade, the perception index categories were 2 and 3.

And for grade 8:

- Average mathematics proficiency was highest for students who were in the "strongly agree" category and lowest for students who were in the "undecided, disagree, strongly disagree" category.
- Less than half of the students (32 percent) were in the "strongly agree" category (perception index of 1). Across the nation, 32 percent were in this category, and in Pennsylvania in 1990, 27 percent were in this category.
- Some of the students in Pennsylvania (19 percent), versus 20 percent across the nation, were in the "undecided, disagree, or strongly disagree" category (perception index of 3). In 1990 in Pennsylvania, 23 percent of the students were in this category.
- Compared to 1990, a greater percentage of eighth-grade students in 1992 were in the "strongly agree" category (27 percent in 1990 and 32 percent in 1992).

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TABLE 35

Students' Positive Perceptions and Attitudes Toward Mathematics

	Grade 4	Grade 8	
	1992	1990	1992
Student "Perception Index" Groups	Percentage and Proficiency	Percentage and Proficiency	Percentage and Proficiency
Stongly agree *("perception index" of 1)*			
Pennsylvania	--- (--.-)	27 (1.0)	32 (0.9) >
	--- (--.-)	275 (2.1)	278 (2.2)
Northeast	--- (--.-)	26 (4.9)	30 (2.0)
	--- (--.-)	276 (4.5)!	278 (3.4)
Nation	--- (--.-)	27 (1.3)	32 (0.8) >
	--- (--.-)	272 (2.0)	276 (1.2)
Agree *("perception index" of 2)*			
Pennsylvania	84 (0.9)	50 (0.9)	49 (0.9)
	227 (1.3)	267 (1.7)	270 (1.5)
Northeast	83 (1.0)	53 (3.0)	48 (1.3)
	227 (2.3)	271 (4.1)	268 (3.3)
Nation	80 (0.6)	49 (1.0)	48 (0.8)
	222 (0.9)	263 (1.7)	266 (1.0)
Undecided, disagree, strongly disagree *("perception index" of 3)*			
Pennsylvania	16 (0.9)	23 (1.0)	19 (0.9) <
	207 (2.1)	256 (2.0)	260 (2.2)
Northeast	17 (1.0)	21 (3.0)	22 (1.5)
	203 (3.5)	262 (6.0)	259 (4.0)
Nation	20 (0.6)	24 (1.2)	20 (0.8) <
	201 (1.2)	252 (2.0)	255 (1.6)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. --- "Strongly Agree" and "Strongly Disagree" were not response choices for Grade 4. A "perception index" of 1 represents very positive perceptions toward mathematics and a "perception index" of 3 represents uncertain or negative perceptions toward mathematics. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

SUMMARY

Some out-of-school factors cannot be changed, but others can be altered in a positive way to influence a student's learning and motivation. Partnerships among students, parents, teachers, and the community can affect the educational environment in the home, resulting in more out-of-school reading and an increased value placed on educational achievement, among other desirable outcomes.

The data related to out-of-school factors for public-school students show that:

- Grade 4 students in Pennsylvania who had all four types of reading materials (an encyclopedia, newspapers, magazines, and more than 25 books in the home) showed a higher mathematics proficiency than did students with zero to two types of materials. This is similar to the results for the grade 8 students in Pennsylvania, where students who had all four types of materials showed a higher mathematics proficiency than did students who had zero to two types.
- Some of the fourth-grade students in Pennsylvania (19 percent) watched one hour or less of television each day; 18 percent watched six hours or more.
- Some of the eighth-grade students in Pennsylvania (16 percent) watched one hour or less of television each day; 9 percent watched six hours or more. In 1990, 14 percent watched one hour or less of television each day while 10 percent watched six hours or more.
- In grade 8, average mathematics proficiency was highest for eighth-grade students who did not miss any days of school and lowest for eighth-grade students who missed three or more days of school.
- In grade 4, average mathematics proficiency was higher for students who were in the "agree" category than for students who were in the "undecided, disagree" category relating to students' perceptions of mathematics.
- In grade 8, average mathematics proficiency was highest for students who were in the "strongly agree" category and lowest for students who were in the "undecided, disagree, strongly disagree" category.

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PROCEDURAL APPENDIX

This appendix provides an overview of the technical details of the 1992 Trial State Assessment Program. It includes a discussion of the assessment design, the mathematics framework and objectives upon which the assessment was based, and the procedures used to analyze the results.

The objectives for the assessment were developed through a consensus process managed by the Council of Chief State School Officers, and the items were developed through a similar process managed by Educational Testing Service. The development of the Trial State Assessment Program benefitted from the involvement of hundreds of representatives from State Education Agencies who attended numerous NETWORK meetings; served on committees; reviewed the framework, objectives, and questions; and, in general, provided important suggestions on all aspects of the program.

Assessment Design

The 1992 Trial State Assessment was based on a *focused balanced incomplete block (BIB) spiral matrix design* -- a design that enables broad coverage of mathematics content while minimizing the burden for any one student.

At grade 4, 158 mathematics items were developed for the assessment, including 53 regular constructed-response and five extended constructed-response items; at grade 8, 183 mathematics items were developed, including 59 regular constructed-response and six extended constructed-response items. To permit comparisons between the 1990 and 1992 assessments, 76 items at grade 8 that had been included in the 1990 assessment were also administered in the 1992 assessment.

The first step in implementing the BIB design required dividing the entire set of mathematics items at each grade level into 13 units called *blocks*. Each block was designed to be completed in 15 minutes. The blocks were assembled into assessment booklets so that each booklet contained three background questionnaires -- the first consisting of general background questions, the second comprising mathematics background questions, and the third containing questions about the students' motivation to do well in the assessment -- and three blocks of cognitive mathematics items. Students were given five minutes to complete each of the first two background questionnaires, 45 minutes to complete the three 15-minute blocks of mathematics items, and three minutes to complete the third background questionnaire. Thus, the first part of the assessment required approximately one hour of student time.

In accordance with the BIB design, the blocks were assigned to the assessment booklets so that each block appeared in exactly six booklets and each block appeared with every other block in one booklet. Twenty-six assessment booklets were used at each grade level for the Trial State Assessment Program. The booklets were *spiraled* or interleaved in a systematic sequence so that each booklet appeared an appropriate number of times in the sample. The students within an assessment session were assigned booklets in the order in which the booklets were spiraled. Thus, students in any given session received a variety of different booklets and only a small number of students in the session received the same booklet. Following this administration, all students were given a special booklet with the Estimation block. The Estimation items were administered using a 15-minute paced audiotape which made any direct calculations of answers difficult. Twenty multiple-choice Estimation items were administered at grade 4 and 22 at grade 8.

Assessment Content

The framework and objectives for the Trial State Assessment Program were developed using a broad-based consensus process, as described in the Overview to this report.[1] The assessment framework consisted of two dimensions: mathematical content areas and abilities. The five content areas assessed were Numbers and Operations; Measurement; Geometry; Data Analysis, Statistics, and Probability; and Algebra and Functions. Skills in Estimation were also measured (see Figure A1).

The 1992 mathematics assessment included multiple-choice and regular constructed-response questions, as well as the use of calculators, manipulatives, and a paced audio-taped estimation section. The three mathematical ability areas assessed were Conceptual Understanding, Procedural Knowledge, and Problem Solving (see Figure A2). The information from the Estimation section is intended to supplement the data obtained from the Numbers and Operations and the Measurement questions administered using the more traditional paper-and-pencil or calculator approaches.

The extended constructed-response questions required the students to formulate and demonstrate more detailed problem-solving skills, required up to about five minutes to complete, and were scored using a partial-credit model. Six examples of extended constructed-response questions used in the 1992 Trial State Assessment are provided, starting on page 124. Table A1, on page 123, gives the percentages of students attaining each of the score levels for the six example items.

Data Analysis and Scales

Once the assessments were conducted and information from the assessment booklets was compiled in a database, the assessment data were weighted to match known population proportions and adjusted for nonresponse. Analyses were then conducted to determine the percentages of students who gave various responses to each cognitive and background question.

Item response theory (IRT) was used to estimate average mathematics proficiency for each jurisdiction and for various subpopulations, based on students' performance on the set of mathematics items they received. IRT provides a common scale on which performance can be reported for the nation, each jurisdiction, and subpopulations, even when all students do not answer the same set of questions. This common scale makes it possible to report on relationships between students' characteristics (based on their responses to the background questions) and their overall performance on the assessment.

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[1] See National Assessment of Educational Progress, *Mathematics Objectives: 1990 Assessment* (Princeton, NJ: Educational Testing Service, 1988) for a description of the frameworks and objectives.

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FIGURE A1 | Content Areas and Skills Assessed

Numbers and Operations

This content area focuses on students' understanding of numbers (whole numbers, fractions, decimals, integers) and their application to real-world situations, as well as computational and estimation situations. Understanding numerical relationships as expressed in ratios, proportions, and percents is emphasized. Students' abilities in estimation, mental computation, use of calculators, generalization of numerical patterns, and verification of results are also included.

Measurement

This content area focuses on students' ability to describe real-world objects using numbers. Students are asked to identify attributes, select appropriate units, apply measurement concepts, and communicate measurement-related ideas to others. Questions are included that require an ability to read instruments using metric, customary, or nonstandard units, with emphasis on precision and accuracy. Questions requiring estimation, measurements, and applications of measurements of length, time, money, temperature, mass/weight, area, volume, capacity, and angles are also included in this content area.

Geometry

This content area focuses on students' knowledge of geometric figures and relationships and on their skills in working with this knowledge. These skills are important at all levels of schooling as well as in practical applications. Students need to be able to model and visualize geometric figures in one, two, and three dimensions and to communicate geometric ideas. In addition, students should be able to use informal reasoning to establish geometric relationships.

Data Analysis, Statistics, and Probability

This content area focuses on data representation and analysis across all disciplines and reflects the importance and prevalence of these activities in our society. Statistical knowledge and the ability to interpret data are necessary skills in the contemporary world. Questions emphasize appropriate methods for gathering data, the visual exploration of data, and the development and evaluation of arguments based on data analysis.

Algebra and Functions

This content area is broad in scope, covering algebraic and functional concepts in more informal, exploratory ways for the fourth and eighth grades. Proficiency in this content area requires both manipulative facility and conceptual understanding; it involves the ability to use algebra as a means of representation and algebraic processing as a problem-solving tool. Functions are viewed not only in terms of algebraic formulas, but also in terms of verbal descriptions, tables of values, and graphs.

Estimation Skills

Estimation involving whole numbers, fractions, and decimals pervades most of the content areas in mathematics. Presented using a paced audiotape procedure, questions assess students' abilities to make estimates appropriate to a wide variety of situations. Estimates take into consideration such factors as knowing when to estimate and whether to overestimate or underestimate in a particular problem.

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FIGURE A2 | Mathematical Abilities

The following three categories of mathematical abilities are not to be construed as hierarchical. For example, problem solving involves interactions between conceptual knowledge and procedural skills, but what is considered complex problem solving at one grade level may be considered conceptual understanding or procedural knowledge at another.

Conceptual Understanding

Students demonstrate conceptual understanding in mathematics when they provide evidence that they can recognize, label, and generate examples and counterexamples of concepts; can use and interrelate models, diagrams, and varied representations of concepts; can identify and apply principles; know and can apply facts and definitions; can compare, contrast, and integrate related concepts and principles; can recognize, interpret, and apply the signs, symbols, and terms used to represent concepts; and can interpret the assumptions and relations involving concepts in mathematical settings. Such understandings are essential to performing procedures in a meaningful way and applying them in problem-solving situations.

Procedural Knowledge

Students demonstrate procedural knowledge in mathematics when they provide evidence of their ability to select and apply appropriate procedures correctly, verify and justify the correctness of a procedure using concrete models or symbolic methods, and extend or modify procedures to deal with factors inherent in problem settings. Procedural knowledge includes the various numerical algorithms in mathematics that have been created as tools to meet specific needs in an efficient manner. It also encompasses the abilities to read and produce graphs and tables, execute geometric constructions, and perform noncomputational skills such as rounding and ordering.

Problem Solving

In problem solving, students are required to use their reasoning and analytic abilities when they encounter new situations. Problem solving includes the ability to recognize and formulate problems; determine the sufficiency and consistency of data; use strategies, data, models, and relevant mathematics; generate, extend, and modify procedures; use reasoning (i.e., spatial, inductive, deductive, statistical, and proportional), and judge the reasonableness and correctness of solutions.

A scale ranging from 0 to 500 was created to report performance for each content area and for Estimation skills. The scales summarize examinee performance across all three item types used in the assessment (multiple-choice, regular constructed-response, and extended constructed-response). In producing the scales, three distinct IRT models were used. Multiple-choice items were scaled using the three-parameter logistic model; regular constructed-response items were scaled using the two-parameter logistic model; and the extended constructed-response items were scaled using a generalized partial-credit model. Each content-area scale was based on the distribution of student performance across all three grades assessed in the 1990 national assessment (grades 4, 8, and 12) and had a mean of 250 and a standard deviation of 50. A composite scale was created as an overall measure of students' mathematics proficiency. The composite scale was a weighted average of the five content area scales, where the weight for each content area was proportional to the relative importance assigned to the content area in the specifications developed by the Mathematics Objectives Panel.

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TABLE A1 | Student Score-Level Percentages for Constructed-Response Example Items

		No Response	Incorrect	Minimal	Partial	Satisfactory	Extended
EXAMPLE ITEM 1							
Pizza Comparison	Grade 4						
Pennsylvania		5 (0.6)	53 (2.4)	16 (1.6)	2 (0.6)	6 (1.1)	18 (1.7)
Nation		8 (0.9)	49 (1.9)	18 (1.3)	2 (0.6)	8 (0.9)	15 (1.3)
EXAMPLE ITEM 2							
Graph of Pockets	Grade 4						
Pennsylvania		4 (0.8)	49 (2.1)	22 (2.0)	15 (1.6)	6 (1.2)	5 (0.9)
Nation		6 (0.8)	46 (1.6)	23 (1.3)	15 (0.9)	7 (0.8)	3 (0.6)
EXAMPLE ITEM 3							
Laura Use Calculator	Grade 4						
Pennsylvania		11 (1.4)	46 (1.9)	12 (1.5)	8 (1.1)	15 (1.3)	8 (1.1)
Nation		17 (1.4)	45 (1.7)	9 (1.0)	10 (1.3)	13 (1.4)	6 (1.0)
EXAMPLE ITEM 4							
Marcy Dot Pattern	Grade 8						
Pennsylvania		12 (1.5)	63 (2.2)	12 (1.4)	6 (1.0)	1 (0.5)	6 (1.1)
Nation		16 (1.2)	64 (1.4)	9 (0.8)	6 (0.7)	1 (0.2)	4 (0.6)
EXAMPLE ITEM 5							
Treena's Budget	Grade 8						
Pennsylvania		19 (1.5)	35 (2.3)	23 (1.9)	20 (1.6)	2 (0.6)	1 (0.5)
Nation		23 (1.4)	37 (1.8)	21 (1.3)	14 (1.1)	2 (0.4)	2 (0.5)
EXAMPLE ITEM 6							
Radio Station	Grade 8						
Pennsylvania		12 (1.2)	44 (2.1)	22 (1.7)	14 (1.4)	6 (1.1)	3 (0.7)
Nation		17 (1.2)	45 (1.8)	21 (1.4)	12 (1.1)	4 (0.6)	1 (0.3)

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EXAMPLE ITEM 1

Pizza Comparison
Grade 4

Extended Constructed-Response Item: Numbers and Operations

Think carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.

José ate 1/2 of a pizza.

Ella ate 1/2 of another pizza.

José said that he ate more pizza than Ella, but Ella said that they both ate the same amount. Use words and pictures to show that José could be right.

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EXAMPLE ITEM 1
(continued)

Pizza Comparison
Grade 4

Possible Correct Response

This would be true when José's pizza is larger than Ella's pizza. Half of a larger unit is more than half of a smaller unit.

Scoring Guide

No response.

Incorrect. The work is completely incorrect, irrelevant, or I don't know.

Minimal. Student answers that 1/2 is always equal 1/2. Also, references to the number of pizzas, or toppings.

Partial. Statements such as "José's pizza had bigger pieces."

Satisfactory. Gives a picture where sizes are different, but gives no explanation.

Extended. Student fully explains and mentions relative size of the pizzas.

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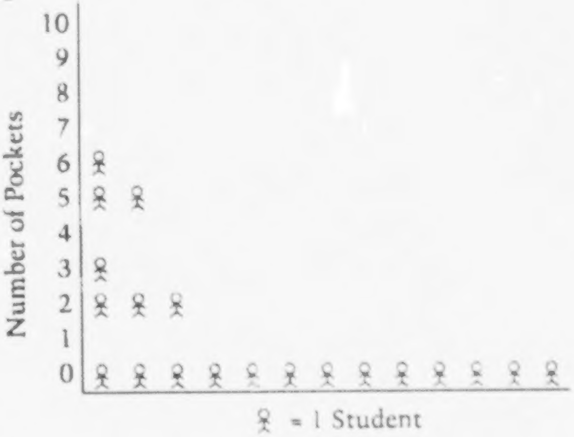
EXAMPLE ITEM 2 | **Graphs of Pockets**
Grade 4

Extended Constructed-Response Item: Data Analysis, Statistics, and Probability

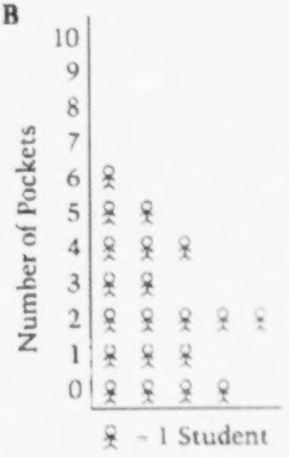
Think carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.

There are 20 students in Mr. Pang's class. On Tuesday most of the students in the class said they had pockets in the clothes they were wearing.

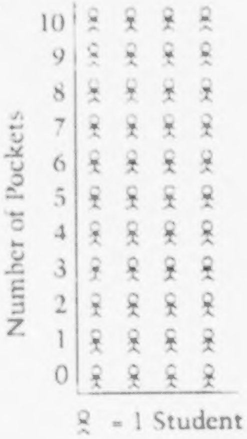
A



B



C



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EXAMPLE ITEM 2
(continued)

Graphs of Pockets
Grade 4

Extended Constructed-Response Item (continued)

Which of the graphs most likely shows the number of pockets that each child had? ______

Explain why you chose that graph.

Explain why you did not choose the other graphs.

Possible Correct Response

Graph B, because it had 20 students and most of the students had pockets.

It could not be Graph A because most of the students should have pockets.

It could not be Graph C since there are more than 20 students shown OR it is not likely that there would be the same number of students for each number of pockets OR most clothes don't have 10 pockets.

Scoring Guide

No response.

Incorrect. The work is completely incorrect, irrelevant, or I don't know.

Minimal. The student chooses Graph B with no explanation OR the student chooses Graph A and Graph C with an explanation that shows some understanding.

Partial. The student chooses Graph B but does not give an adequate explanation OR student chooses Graph B but gives no explanation why; student explains why it is not Graph C OR why it is not Graph A.

Satisfactory. The student chooses Graph B and gives a good explanation why but does not mention the other graphs OR student gives a good explanation of why it cannot be Graph A and Graph C, but does not give a good explanation of why it is Graph B.

Extended. The student chooses Graph B and gives a reason why it cannot be the others.

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EXAMPLE ITEM 3

Laura Use Calculator
Grade 4

Extended Constructed-Response Item: Numbers and Operations

Laura wanted to enter the number 8375 into her calculator. By mistake, she entered the number 8275. Without clearing the calculator, how could she correct her mistake?

Without clearing the calculator, how could she correct her mistake another way?

Did you use the calculator on this question?
Yes No

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EXAMPLE ITEM 3
(continued)

Laura Use Calculator
Grade 4

Possible Correct Response

She could add 100 to the number in the display because she wanted a larger digit in the hundreds' place OR she could also add 50 two times (or any other correct combination).

Scoring Guide

No response.

Incorrect. The work is completely incorrect, irrelevant, or I don't know.

Minimal. Student's response involves clearing the calculator with a method other than using ON C or C or CE. For example: Refers to a memory-clearing button (RM on the new TI-108 calculator or MRC on the old calculator).

Partial. Student knows you need to add 1 to the 2 but has the wrong place value OR doesn't mention place value OR subtracts 100 instead of adding OR subtracts 16,650.

Satisfactory. Student gives only one correct way.

Extended. Student gives two correct ways to change the number.

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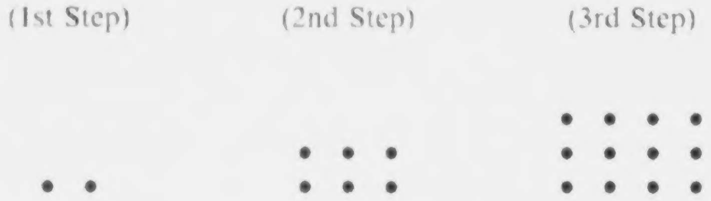
EXAMPLE ITEM 4

Marcy Dot Pattern
Grade 8

Extended Constructed-Response Item: Algebra and Functions

This question requires you to show your work and explain your reasoning. You may use drawings, words, and numbers in your explanation. Your answer should be clear enough so that another person could read it and understand your thinking. It is important that you show all your work.

A pattern of dots is shown below. At each step, more dots are added to the pattern. The number of dots added at each step is more than the number added in the previous step. The pattern continues infinitely.



Marcy has to determine the number of dots in the 20th step, but she does not want to draw all 20 pictures and then count the dots.

Explain or show how she could do this and give the answer that Marcy should get for the number of dots.

Did you use the calculator on this question?

Yes No

EXAMPLE ITEM 4
(continued)

Marcy Dot Pattern
Grade 8

Possible Correct Response

Explanation should include one of the following ideas with no false statements.

a: For each successive step, the number of rows and the number of columns is increasing by 1, forming a pattern. For example, the first step forms 1-by-2 rows and columns, the next step 2-by-3, the third step 3-by-4, and so on. Continuing this pattern would mean that the 20th step has 20 x 21 dots or 420 dots.

b. Look at successive differences between consecutive steps. The differences 4, 6, 8, 10.... form a pattern. There are 19 differences forming the pattern 4, 6, 8, 10, ..., 38, 40 and this sum is (9 x 44) + 22 or 418. However, 2 must be added for the first step, yielding a response of 420.

Scoring Guide

No response.

Incorrect. The work is completely incorrect, irrelevant, or I don't know.

Minimal. An attempt to generalize or to draw all 20 pictures in the pattern (with a clear understanding of the pattern).

Partial. A partial (incomplete) correct explanation.

Satisfactory. Correct explanation of pattern but does not include or omits the correct number of dots (420).

Extended. Correct answer.

EXAMPLE ITEM 5

Treena's Budget
Grade 8

Extended Constructed-Response Item: Numbers and Operations

This question requires you to show your work and explain your reasoning. You may use drawings, words, and numbers in your explanation. Your answer should be clear enough so that another person could read it and understand your thinking. It is important that you show all your work.

Treena won a 7-day scholarship worth $1,000 to the Pro Shot Basketball camp. Round-trip travel expenses to the camp are $335 by air or $125 by train. At the camp she must choose between a week of individual instruction at $60 per day or a week of group instruction at $40 per day. Treena's food and other expenses are fixed at $45 per day. If she does not plan to spend any money other than the scholarship, what are all choices of travel and instruction plans that she could afford to make?

Explain your reasoning.

Did you use the calculator on this question?

Yes No

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EXAMPLE ITEM 5
(continued)

Treena's Budget
Grade 8

Possible Correct Response

Treena's fixed expenses will be 7 x \$45 = \$315 for the 7 days. Therefore, she has \$1,000 - \$315 = \$685 to spend for instruction and travel. The group plan will cost 7 x \$40 = \$280 while the individual plan will cost 7 x \$60 = \$420. Treena has 3 options:

Group and Train:	\$280 + \$125 = \$405
Group and Plane:	\$280 + \$335 = \$615
Individual and Train:	\$420 + \$125 = \$545

She cannot choose the individual plan and travel by plane because her total expenses would be \$1,070 which is greater than the allotted scholarship.

Any full-credit response clearly communicates that Treena has 3 options, what the 3 options are, and how the student arrived at the 3 options.

Scoring Guide

No response.

Incorrect. The work is completely incorrect, irrelevant, or I don't know.

Minimal. a) Student indicated conclusions with no mathematical evidence OR b) Student work contains major mathematical errors and/or flaws in reasoning. For example: the student does not consider Treena's fixed expenses.

Partial. a) Student indicates 1 or more correct conclusions, but the work contains some computational errors OR b) Student has correct mathematics, but indicates no conclusion.

Satisfactory. a) Student shows correct mathematical evidence that Treena has 3 choices, but the explanation is unclear or incomplete OR b) Student shows correct mathematical evidence for any 2 of Treena's 3 choices and the explanation is clear and complete.

Extended. Full-credit response: correct solution and complete, clear explanation.

EXAMPLE ITEM 6

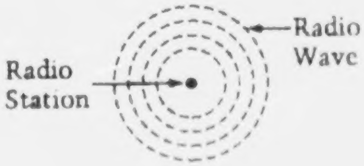
Radio Station
Grade 8

Extended Constructed-Response Item: Geometry

This question requires you to show your work and explain your reasoning. You may use drawings, words, and numbers in your explanation. Your answer should be clear enough so that another person could read it and understand your thinking. It is important that you show all your work.

Radio station KMAT in Math City is 200 miles from radio station KGEO in Geometry City. Highway 7, a straight road, connects the two cities.

KMAT broadcasts can be received up to 150 miles in all directions from the station and KGEO broadcasts can be received up to 125 miles in all directions. Radio waves travel from each radio station through the air, as represented below.



On the next page, draw a diagram that shows the following.

- Highway 7
- The location of the two radio stations
- The part of Highway 7 where both radio stations can be received

Be sure to label the distances along the highway and the length in miles of the part of the highway where both stations can be received.

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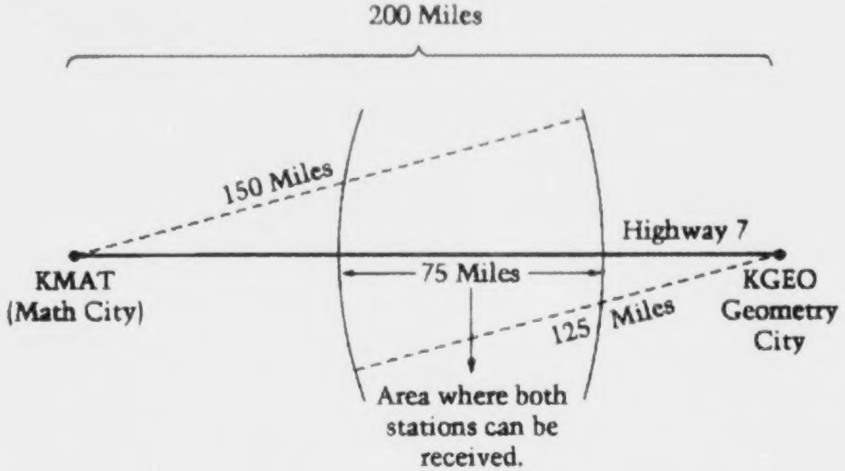
EXAMPLE ITEM 6
(continued)

Radio Station
Grade 8

Possible Correct Response



200 Miles
150 Miles
Highway 7
KMAT
(Math City)
75 Miles
KGEO
Geometry
City
125 Miles
Area where both
stations can be
received.

There is a 75-mile part of Highway 7 that is within both broadcast areas. It starts 75 miles outside Math City and ends 150 miles outside Math City.

Scoring Guide

No response.

Incorrect. The work is completely incorrect, irrelevant, or I don't know.

Minimal. Map with cities, highway, and 200 miles labeled (or some indication of scale) OR map that uses some, but not all of the given information.

Partial. Map with cities, highway, and 200 miles labeled (or some indication of scale) AND identifies incorrect common broadcast area (e.g., not on Highway 7) or insufficiently identifies an area.

Satisfactory. Map with cities, highway, and 200 miles labeled and identifies common broadcast area on Highway 7 but omits or incorrectly computes length of common area.

Extended. Correct answer.

Questionnaires for Teachers and Schools

As part of the Trial State Assessment, questionnaires were given to the mathematics teachers of assessed students and to the principal or other administrator in each participating school.

A Background Panel drafted a set of issues and guidelines and made recommendations concerning the design of these questionnaires. For the 1992 assessment, the teacher and school questionnaires focused on five educational areas: instructional content, instructional practices and experiences, teacher characteristics, school conditions and context, and conditions beyond school (i.e., home support, out-of-school activities, and attitudes). Similar to the development of the materials given to students, the guidelines and the teacher and school questionnaires were prepared through an iterative process that involved extensive development, field testing, and review by external advisory groups.

It is important to note that in this report, as in all NAEP reports, the student is always the unit of analysis, even when information from the teacher or school questionnaire is being reported. Having the student as the unit of analysis makes it possible to describe the instruction received by representative samples of fourth- or eighth-grade students in public schools. Although this approach may provide a different perspective from that which would be obtained by simply collecting information from a sample of fourth- or eighth-grade mathematics teachers or from a sample of schools, it is consistent with NAEP's goal of providing information about the educational context and performance of students.

MATHEMATICS TEACHER QUESTIONNAIRE

The questionnaires for fourth- and eighth-grade mathematics teachers consisted of two parts. The first requested information about the teacher, such as race ethnicity and gender, as well as academic degrees held, teaching certification, training in mathematics, and ability to get instructional resources. In the second part, teachers were asked to provide information on each class they taught that included one or more students who participated in the Trial State Assessment Program. The information included, among other things, the extent to which textbooks or worksheets were used, the instructional emphasis placed on different mathematical topics, and the use of various instructional approaches. Because of the nature of the sampling for the Trial State Assessment, the responses to the mathematics teacher questionnaire do not necessarily represent all fourth- and eighth-grade mathematics teachers in a state or territory. Rather, they represent the teachers of the particular students being assessed.

SCHOOL CHARACTERISTICS AND POLICIES QUESTIONNAIRE

An extensive school questionnaire was completed by principals or other administrators in the schools participating in the Trial State Assessment. In addition to questions about the individuals who completed the questionnaires, there were questions about school policies, course offerings, and special priority areas, among other topics.

Estimating Variability

The statistics reported by NAEP (average proficiencies, percentages of students at or above particular achievement levels, and percentages of students responding in certain ways to background questions) are *estimates* of the corresponding information for the population of fourth- or eighth-grade students in public schools in a state. These estimates are based on the performance of carefully selected, representative *samples* of fourth- and eighth-grade public-school students from the state or territory.

If a different representative sample of students were selected and the assessment repeated, it is likely that the estimates might vary somewhat, and both of these sample estimates might differ somewhat from the value of the mean or percentage that would be obtained if every fourth- or eighth-grade public-school student in the state or territory were assessed. Virtually all statistics that are based on samples (including those in NAEP) are subject to a certain degree of uncertainty. The uncertainty attributable to using samples of students is referred to as *sampling error*.

Like almost all estimates based on assessment measures, NAEP's total group and subgroup proficiency estimates are subject to a second source of uncertainty, in addition to sampling error. As previously noted, each student who participated in the Trial State Assessment was administered a subset of questions from the total set of questions. If each student had been administered a different, but equally appropriate, set of the assessment questions -- or the entire set of questions -- somewhat different estimates of total group and subgroup proficiency might have been obtained. Thus, a second source of uncertainty arises because each student was administered a subset of the total pool of questions.

In addition to reporting estimates of average proficiencies, proportions of students at or above particular achievement levels, and proportions of students giving various responses to background questions, this report also provides estimates of the magnitude of the uncertainty associated with these statistics. These measures of the uncertainty are called *standard errors* and are given in parentheses in each of the tables in the report. The standard errors of the estimates of mathematics proficiency statistics reflect both sources of uncertainty discussed above. The standard errors of the other statistics (such as the proportion of students answering a background question in a certain way or the proportion of students in certain racial/ethnic groups) reflect only sampling error. NAEP uses a methodology called the jackknife procedure to estimate these standard errors.

The reader is reminded that, like all surveys, NAEP results are also subject to other kinds of errors including the effects of necessarily imperfect adjustment for student and school non-response and other largely unknowable effects associated with the particular instrumentation and data collection methods used. Nonsampling errors can be attributed to a number of sources: inability to obtain complete information about all selected students in all selected schools in the sample (some students or schools refused to participate, or students participated but answered only certain items); ambiguous definitions; differences in interpreting questions; inability or unwillingness to give correct information; mistakes in recording, coding, or scoring data; and other errors of collecting, processing, sampling, and estimating missing data. The extent of nonsampling errors is difficult to estimate. By their nature, the impact of such errors cannot be reflected in the data-based estimates of uncertainty provided in NAEP reports.

Drawing Inferences from the Results

One of the goals of the Trial State Assessment Program is to make inferences about the overall population of fourth- and eighth-grade students in public schools in each participating state and territory based on the particular sample of students assessed. One uses the results from the sample -- taking into account the uncertainty associated with all samples -- to make inferences about the population.

The use of *confidence intervals*, based on the standard errors, provides a way to make inferences about the population means and proportions in a manner that reflects the uncertainty associated with the sample estimates. An estimated sample mean proficiency ± 2 standard errors approximates a *95 percent confidence interval* for the corresponding population quantity. This means that with approximately 95 percent confidence, the average performance of the entire population of interest (e.g., all eighth-grade students in public schools in a state or territory) is within ± 2 standard errors of the sample mean.

As an example, suppose that the average mathematics proficiency of the students in a particular state's eighth-grade sample were 256 with a standard error of 1.2. A 95 percent confidence interval for the population quantity would be as follows:

$$\text{Mean} \pm 2 \text{ standard errors} = 256 \pm 2 \cdot (1.2) = 256 \pm 2.4 =$$

$$256 - 2.4 \text{ and } 256 + 2.4 = (253.6,\ 258.4)$$

Thus, one can conclude with 95 percent confidence that the average proficiency for the entire population of eighth-grade students in public schools in that state is between 253.6 and 258.4.

Similar confidence intervals can be constructed for percentages, *provided that the percentages are not extremely large (greater than 90 percent) or extremely small (less than 10 percent).* For extreme percentages, confidence intervals constructed in the above manner may not be appropriate and procedures for obtaining accurate confidence intervals are quite complicated.

Analyzing Subgroup Differences in Proficiencies and Proportions

In addition to the overall results, this report presents outcomes separately for a variety of important subgroups. Many of these subgroups are defined by shared characteristics of students, such as their gender, race/ethnicity, and the type of community in which their school is located. Other subgroups are defined by students' responses to background questions. Still other subgroups are defined by the responses of the assessed students' mathematics teachers to questions in the mathematics teacher questionnaire.

As an example, one might be interested in answering the question: *Do students who reported spending 45 minutes or more doing mathematics homework each day exhibit higher average mathematics proficiency than students who reported spending 15 minutes or less?*

To answer the question posed above, one begins by comparing the average mathematics proficiency for the two groups being analyzed. If the mean for the group that reported spending 45 minutes or more on mathematics homework is higher, one may be tempted to conclude that that group does have higher achievement than the group that reported spending 15 minutes or less on homework. However, even though the means differ, there may be no real difference in performance between the two groups in the population because of the uncertainty associated with the estimated average proficiency of the groups in the sample. Remember that the intent is to make a statement about the entire population, not about the particular sample that was assessed. The data from the sample are used to make inferences about the population as a whole.

As discussed in the previous section, each estimated sample mean proficiency (or proportion) has a degree of uncertainty associated with it. It is therefore possible that if all students in the population had been assessed, rather than a sample of students, or if the assessment had been repeated with a different sample of students or a different, but equivalent, set of questions, the performances of various groups would have been different. Thus, to determine whether there is a *real* difference between the mean proficiency (or proportion of a certain attribute) for two groups in the population, one must obtain an estimate of the degree of uncertainty associated with the difference between the proficiency means or proportions of those groups for the sample. This estimate of the degree of uncertainty -- called *the standard error of the difference* between the groups -- is obtained by taking the square of each group's standard error, summing these squared standard errors, and then taking the square root of this sum.

Similar to the manner in which the standard error for an individual group mean or proportion is used, the *standard error of the difference* can be used to help determine whether differences between groups in the population are real. The difference between the mean proficiency or proportion of the two groups ± *2 standard errors of the difference* represents an approximate 95 percent confidence interval. If the resulting interval includes zero, one should conclude that there is insufficient evidence to claim a real difference between groups in the population. If the interval does not contain zero, the difference between groups is *statistically significant* (different) at the .05 level.

As an example, suppose that one were interested in determining whether the average mathematics proficiency of eighth-grade females is higher than that of eighth-grade males in a particular state's public schools. Suppose that the sample estimates of the mean proficiencies and standard errors for females and males were as follows:

Group	Average Proficiency	Standard Error
Female	259	2.0
Male	255	2.1

The difference between the estimates of the mean proficiencies of females and males is four points (259 - 255). The standard error of this difference is

$$\sqrt{2.0^2 + 2.1^2} = 2.9$$

Thus, an approximate 95 percent confidence interval for this difference is

$$\text{Mean difference} \pm 2 \text{ standard errors of the difference} =$$

$$4 \pm 2 \cdot (2.9) = 4 \pm 5.8 = 4 - 5.8 \text{ and } 4 + 5.8 = (-1.8, 9.8)$$

The value zero is within this confidence interval, which extends from -1.8 to 9.8 (i.e., zero is between -1.8 and 9.8). Thus, one should conclude that there is insufficient evidence to claim a difference in average mathematics proficiency between the population of eighth-grade females and males in public schools in the state.[2]

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[2] The procedure described above (especially the estimation of the standard error of the difference) is, in a strict sense, only appropriate when the statistics being compared come from independent samples. For certain comparisons in the report, the groups were not independent. In those cases, a different (and more appropriate) estimate of the *standard error of the difference* was used.

Throughout this report, when the mean proficiencies or proportions for two groups were compared, procedures like the one described above were used to draw the conclusions that are presented. If a statement appears in the report indicating that a particular group had *higher (or lower)* average proficiency than a second group, the 95 percent confidence interval for the difference between groups did not contain zero. When a statement indicates that the average proficiency or proportion of some attribute was *about the same* for two groups, the confidence interval included zero, and thus no difference could be assumed between the groups. The information described in this section also pertains to comparisons between 1990 and 1992. The reader is cautioned to avoid drawing conclusions solely on the basis of the magnitude of the differences. A difference between two groups in the sample that appears to be slight may represent a statistically significant difference in the population because of the magnitude of the standard errors. Conversely, a difference that appears to be large may not be statistically significant.

The procedures described in this section, and the certainty ascribed to intervals (e.g., a 95 percent confidence interval), are based on statistical theory that assumes that only one confidence interval or test of statistical significance is being performed. However, in each chapter of this report, many different groups are being compared (i.e., multiple sets of confidence intervals are being analyzed). When one considers sets of confidence intervals, statistical theory indicates that the certainty associated with the entire set of intervals is less than that attributable to each individual comparison from the set. If one wants to hold the certainty level for the set of comparisons at a particular level (e.g., .95), adjustments (called multiple comparison procedures) must be made to the methods described in the previous section. One such procedure -- the *Bonferroni method* -- was used in the analyses described in this report to form confidence intervals for the differences between groups whenever sets of comparisons were considered. Thus, the confidence intervals in the text that are based on sets of comparisons are more conservative than those described on the previous pages. A more detailed description of the use of the Bonferroni procedure appears in the Trial State Assessment technical report.

Statistics with Poorly Determined Standard Errors

The standard errors for means and proportions reported by NAEP are statistics and therefore are subject to a certain degree of uncertainty. In certain cases, typically when the standard error is based on a small number of students, or when the group of students is enrolled in a small number of schools, the amount of uncertainty associated with the standard errors may be quite large. Throughout this report, estimates of standard errors subject to a large degree of uncertainty are followed by the symbol "!". In such cases, the standard errors -- and any confidence intervals or significance tests involving these standard errors -- should be interpreted cautiously. Further details concerning procedures for identifying such standard errors are discussed in the Trial State Assessment technical report.

Minimum Subgroup Sample Sizes

Results for mathematics proficiency and background variables were tabulated and reported for groups defined by race/ethnicity, type of school community, gender, and parents' education level. NAEP collects data for five racial/ethnic subgroups (White, Black, Hispanic, Asian/Pacific Islander, and American Indian/Alaskan Native), four types of communities (Advantaged Urban, Disadvantaged Urban, Extreme Rural, and Other Communities), and five levels of parents' education (Graduated College, Some Education After High School, Graduated High School, Did Not Finish High School, and I Don't Know). However, in many states or territories, and for some regions of the country, the number of students in some of these groups was not sufficiently high to permit accurate estimation of proficiency and/or background variable results. As a result, data are not provided for the subgroups with very small sample sizes. For results to be reported for any subgroup, a minimum sample of 62 students was required. For statistical tests pertaining to subgroups or to a trend from 1990 to 1992, the sample size for both groups had to be at least 62. This number was determined by computing the sample size required to detect an effect size of .2 total-group standard deviation units with a probability of .8 or greater.

The effect size of .2 pertains to the *true* difference between the average proficiency of the subgroup in question and the average proficiency for the total fourth- or eighth-grade public-school population in the state or territory, divided by the standard deviation of the proficiency in the total population. If the *true* difference between subgroup and total group mean is .2 total-group standard deviation units, then a sample size of at least 62 is required to detect such a difference with a probability of .8. Further details about the procedure for determining minimum sample size appear in the Trial State Assessment technical report.

Describing the Size of Percentages

Some of the percentages reported in the text of the report are given quantitative descriptions. For example, the number of students being taught by teachers with master's degrees in mathematics might be described as "relatively few" or "almost all," depending on the size of the percentage in question. Any convention for choosing descriptive terms for the magnitude of percentages is to some degree arbitrary. The descriptive phrases used in the report and the rules used to select them are shown below.

Percentage	Description of Text in Report
$p = 0$	None
$0 < p \leq 10$	Relatively few
$10 < p \leq 20$	Some
$20 < p \leq 30$	About one quarter
$30 < p \leq 44$	Less than half
$44 < p \leq 55$	About half
$55 < p \leq 69$	More than half
$69 < p \leq 79$	About three quarters
$79 < p \leq 89$	Many
$89 < p < 100$	Almost all
$p = 100$	All

Reanalysis of 1990 Results

An enhanced version of the statistical procedures employed in 1990 was used to obtain results for the 1992 mathematics assessment. Preliminary research with simulated data and experience with selected reanalyses of previously reported 1990 NAEP data sets suggested that small, but consistent, differences in the results produced by the two sets of procedures would be obtained. The nature and magnitude of such differences would have little or no effect on state-to-state and state-to-nation comparisons. However, certain within-state comparisons between 1992 and 1990 would be affected to a degree that is not ignorable.

In order to maintain the integrity of the 1990 NAEP mathematics scales for trend analysis, a decision was made to reanalyze the 1990 results and report revised figures. The 1990 estimates given in the 1992 state reports are based on the reanalyzed 1990 results. In the vast majority of cases, the reanalyzed results will differ trivially, if at all, from those originally reported and the magnitudes of the differences between the original and reanalyzed results rarely exceed a standard error. Slightly larger, but still modest, differences between the original and reanalyzed results may be observed for the composite-scale standard deviations and proportions of students at or above NAEP anchor levels.

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ACHIEVEMENT LEVELS APPENDIX

Setting achievement levels is a method for setting standards on the NAEP assessment that identifies what students should know and should be able to do at various points along the proficiency scale. The method depends on securing and summarizing a set of judgmental ratings of expectations for student educational performance on specific items. The NAEP proficiency scale is a numerical index of students' performance in mathematics ranging from 0 to 500 and has three achievement levels -- Basic, Proficient, and Advanced -- mapped onto it for each grade level assessed.

In developing the threshold values for the levels, a broadly constituted panel of judges -- including teachers (50 percent), non-teacher educators (20 percent), and non-educators (30 percent) -- rated a grade-specific item pool using the Board's policy definitions for Basic, Proficient, and Advanced.[1] The policy definitions are as follows:

BASIC	This level, below Proficient, denotes partial mastery of the knowledge and skills that are fundamental for proficient work at each grade.
PROFICIENT	This central level represents solid academic performance for each grade tested. Students reaching this level have demonstrated competency over challenging subject matter and are well prepared for the next level of schooling.
ADVANCED	This higher level signifies superior performance beyond proficient grade-level mastery at each grade.

The policy definitions were operationalized by the judges in terms of specific mathematical skills, knowledge, and behaviors that were in accordance with the current mathematics assessment framework, and were generally agreed to be appropriate expectations for students in each grade at each level. The judges' operationalized definitions were incorporated into lists of descriptors that represented what borderline students should be able to do at each of the policy levels. The purpose of having panelists develop their own operational definitions of the achievement levels was to ensure that all panelists would have a common understanding of borderline performances and a common set of content-based referents to use during the item-rating process.

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[1] Non-educators represented business, labor, government service, parents, and the general public.

The judges (24 at grade 4 and 22 at grade 8) each rated half of the items in the NAEP pool in terms of the expected probability that a student at a borderline achievement level would answer the item correctly, based on the judges' operationalization of the policy definitions and the factors that influence item difficulty. To assist the judges in generating consistently-scaled ratings, the rating process was repeated twice, with feedback. Information on consistency among different judges and on the difficulty of each item[2] was fed back into the first repetition (round 2), while information on consistency within each judge's set of ratings was fed back into the second repetition (round 3). The third round of ratings permitted the judges to discuss their ratings among themselves to resolve problematic ratings. The mean final rating of the judges aggregated across items yielded the threshold values in the percent correct metric. These cut scores were then mapped onto the NAEP scale (which is defined and scored using item response theory, rather than percent correct) to obtain the scale scores for the achievement levels. The judges' ratings, in both metrics, and their associated errors of measurement are shown below. The Board accepted the panel's achievement levels and, for reporting purposes, set final cutpoints one standard error (a measure of consistency among the judges' ratings) below the mean levels.

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FIGURE L1 | **Cutpoints for Achievement Levels**

Grade	Level	Mean Percent Correct (Round 3)	Scale Score (From Mean Percents)	Standard Error of Scale Score	Scale Score Cutpoint for Reporting
4	Basic	39	213	1.9	211
4	Proficient	65	252	4.1	248
4	Advanced	84	284	4.0	280
8	Basic	48	258	2.4	256
8	Proficient	71	300	5.7	294
8	Advanced	87	336	4.8	331

After the ratings were completed, the judges for each grade level reviewed the operationalized descriptions developed by the judges of the other grade levels as well as their own descriptions and came up with achievement level descriptions that were generally acceptable to all three grade-group judges. However, the descriptions varied in format, sharpness of the language, and degree of specificity of the statements. Therefore, another panel at a subsequent validation meeting improved the wording and modified the language of the achievement level descriptions to reflect more closely the terminology of the NCTM standards for mathematics.[3]

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[2] Item difficulty estimates were based on a preliminary, partial set of responses to the national assessment.

[3] *Curriculum and Evaluation Standards for School Mathematics.* (Reston, Va: National Council of Teachers of Mathematics, 1989).

Finally, for each achievement level, exemplar items needed to be selected that reflected the kinds of tasks that examinees at or above the level were likely to be able to perform successfully. While the judges discussed items and made recommendations, the task of final selection was put to a subsequent validation panel. Several criteria were used to select items as candidates for exemplars. From the pool of items scheduled for public release, items were deleted that students at any level were more likely to get wrong than right (expected p-value $\leq .50$). Remaining items that did not match any of the descriptions were also deleted. A few items were deleted that did not have increasing p-values from Basic, to Proficient, to Advanced. The validation panels then reviewed the matched and classified item sets and selected exemplars based on the quality of the items, the way the items collectively represented the subscales, and the appropriateness of the items to the grade (for items administered to more than one grade). In Chapter 1, Figure 2 provides the final descriptions of the six achievement levels for grades 4 and 8, along with exemplar items to illustrate what students at each level should be able to perform. In principle, the descriptions of the levels, though based on the 1992 item pool, apply to the current assessment framework and will not change from year to year (that is, until the framework changes). However, the sample items reflective of the levels will need to be updated each time the assessment is administered. Table 4 in Chapter 1 provides the percentage of students at or above each of the six levels and the percentage of students below the Basic level for each grade.

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SCALE ANCHORING APPENDIX

Scale anchoring is a method for defining performance along a proficiency scale to characterize what students know and can do at each level that differentiates them from students performing at lower levels. NAEP summarized students' overall mathematics performance on a 0 to 500 proficiency scale anchored at four points -- level 200, 250, 300, and 350.[1]

To develop the descriptions of the skills, knowledge, and understandings that characterize each anchor level, NAEP used the 1990 and 1992 assessment results to identify sets of questions typically answered correctly by most students at a particular level but answered incorrectly by a majority of students at the next lower level. The criteria for selecting these "benchmark" questions are as follows:

- To define performance at level 200, items were chosen that were answered correctly by at least 65 percent of the students whose proficiency was at or near 200 on the scale.
- To define performance at each of the higher levels on the scale, items were chosen that were: a) answered correctly by at least 65 percent of the students whose proficiency was at or near that level; *and* b) answered incorrectly by a majority (at least 50 percent) of the students performing at or near the next lower level.
- The percentage of students at a level who answered the item correctly had to be at least 30 points higher than the average percentage of students at the next lower level who answered it correctly.

Once these empirically selected sets of questions had been identified, the four sets of anchor questions were studied by a panel of mathematics educators to characterize the types of knowledge, skills, and reasoning abilities needed to answer each set of questions. Each of the four anchor levels was defined by describing the types of mathematics questions that most students attaining that anchor level would be able to perform successfully.

Figure S1 provides a definition of the four anchor levels. Table S1 provides the percentages of students at or above each of the four anchor levels. It is important to note that the definitions of these levels are based solely on the results from the 1990 and 1992 national mathematics assessments of fourth-, eighth-, and twelfth-grade students. The levels are not judgmental standards of what ought to be achieved at a particular grade.

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[1] Defining anchor levels below 200 and above 350 is theoretically possible; however, so few students performed at the extreme ends of the scale that it was impractical to define meaningful levels of mathematics proficiency beyond the four presented here.

FIGURE S1 | Levels of Mathematics Proficiency

LEVEL 200	**Addition and Subtraction, and Simple Problem Solving with Whole Numbers**

Students at or above this level can identify solutions to one-step word problems involving addition or subtraction. They can add and subtract whole numbers in most situations, and when a calculator is available, they can multiply and divide. They are able to select the largest whole number from a set of numbers in the thousands, and can match the verbal and symbolic names for numbers.

Students demonstrated familiarity with length and weight by selecting appropriate instruments and units to measure these attributes. They are able to recognize some basic properties of two-dimensional geometric figures as well as the names of standard examples of these figures. They can extend simple patterns.

LEVEL 250	**Multiplication and Division, Simple Measurement, and Two-Step Problem Solving**

When presented with a problem situation, students at or above this level have some understanding of the problem, can identify extraneous information, and have some knowledge of when to use computational estimation. They have an understanding of addition, subtraction, multiplication, and division with whole numbers. They can solve one- and simple two-step problems involving whole numbers. They are able to round whole numbers and solve simple word problems involving place value, estimation, and multiples.

Students can use a ruler to measure length in centimeters and have some understanding of area and perimeter. They can solve simple problems using readings from instruments. They demonstrate a knowledge of properties of triangles, squares, rectangles, circles, and cubes. They can solve problems that require visualizing, drawing, or manipulating simple geometric shapes. They are able to complete bar graphs and pictographs, as well as use information from graphs or tables to solve simple problems. They can recognize simple number patterns, are beginning to deal informally with the idea of a variable, and have some knowledge of simple probability.

FIGURE S1 (continued) | **Levels of Mathematics Proficiency**

LEVEL 300	Reasoning and Problem Solving Involving Fractions, Decimals, Percents, and Elementary Concepts in Geometry, Statistics, and Algebra

Students at or above this level can use various strategies and explain their reasoning in a variety of problem solving situations. They are able to solve problems involving not only whole numbers but also decimals and fractions. They can represent and find equivalent fractions and use these concepts in solving routine problems. They can find percents of a number and use this skill in simple problems. Multiplication and division of whole numbers have developed to the extent that students can use all four operations in multi-step problems.

Students can read and use instruments in more complex situations. They can find areas of rectangles, recognize relationships among common units of measure, and solve routine problems involving similar triangles and scale drawings. They have knowledge of definitions and properties of simple geometric figures in the plane. Their spatial sense includes the ability to visualize a cube in either three-space or its flattened form in a plane.

Students can calculate averages, select and interpret data from a variety of graphs, list the possible arrangements in a sample space, find the probability of a simple event, and have a beginning understanding of sample bias. They can use knowledge of relative frequencies in simple simulation situations. Students show the ability to evaluate simple expressions and solve linear equations. Students can graph points on coordinate axes, locate the missing coordinates for a corner of a square, and identify which ordered pairs satisfy a given linear equation.

LEVEL 350	Reasoning and Problem Solving Involving Geometric Relationships, Algebra, and Functions

Students at or above this level can reason and estimate with percents. They can recognize scientific notation and find the decimal equivalent. They can apply their knowledge of area and perimeter of simple geometric figures to solve problems. They can find the circumferences of circles and the surface areas of solid figures. They can solve for the length of missing segments in more complex similarity situations. Students can apply the Pythagorean Theorem to find the hypotenuse of a right triangle. They are beginning to use rectangular coordinates in problem solving situations and can apply geometric properties and relationships in solving problems.

Students can compute means from frequency tables, create a sample space to determine probabilities, and read the graph of a step-function. Students can use exponents and evaluate expressions given in functional notation. In number theory, they have an understanding of even and odd numbers and their properties. They can identify an equation describing a linear relation provided in a table, and solve literal equations and systems of two linear equations. They have some knowledge of trigonometric relations. These students can represent and interpret complex patterns and data using numbers, expressions, and graphs. Given the graph of a function, they can identify its zeros and the effect on the graph of taking the absolute value of the function.

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TABLE S1 | Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Proficiency

	Level 350			Level 300		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students			**Percentage of Students**		
TOTAL						
State	0 (0.0)	1 (0.2)	0 (0.2)	0 (0.2)	16 (1.3)	20 (1.4)
Nation	0 (0.0)	1 (0.3)	1 (0.2)	0 (0.1)	15 (1.1)	18 (0.9) >
RACE/ETHNICITY						
White						
State	0 (0.0)	0 (0.2)	0 (0.2)	0 (0.2)	19 (1.3)	23 (1.4)
Nation	0 (0.0)	1 (0.4)	1 (0.2)	0 (0.1)	18 (1.4)	24 (1.2) >
Black						
State	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.3)	4 (2.5)
Nation	0 (0.0)	0 (0.0)	0 (0.2)	0 (0.0)	4 (1.1)	2 (0.5)
Hispanic						
State	0 (0.0)	0 (0.0)	0 (0.0)!	0 (0.2)	3 (2.0)	5 (3.0)!
Nation	0 (0.0)	0 (0.1)	0 (0.1)	0 (0.1)	4 (1.4)	5 (0.8)
TYPE OF COMMUNITY						
Advantaged urban						
State	0 (0.0)!	2 (0.8)!	1 (1.7)!	1 (0.6)!	36 (3.6)!	37 (6.1)!
Nation	0 (0.0)!	2 (1.6)!	2 (1.1)!	2 (0.9)!	29 (5.7)!	37 (5.4)!
Disadvantaged urban						
State	0 (0.0)	0 (0.3)!	0 (0.0)!	0 (0.0)	7 (2.7)!	7 (2.2)!
Nation	0 (0.0)	0 (0.1)!	0 (0.1)	0 (0.0)	9 (2.7)!	5 (1.3)
Extreme rural						
State	0 (0.0)!	0 (0.0)!	0 (0.4)!	0 (0.5)!	13 (3.3)!	23 (5.4)!
Nation	0 (0.0)	0 (0.0)!	0 (0.4)!	0 (0.0)	9 (2.5)!	16 (3.2)!
Other						
State	0 (0.0)	0 (0.2)	0 (0.3)	0 (0.2)	15 (1.6)	22 (1.7) >
Nation	0 (0.0)	0 (0.2)	1 (0.2)	0 (0.1)	14 (1.2)	19 (1.0)
PARENTS' EDUCATION						
College graduate						
State	0 (0.0)	1 (0.4)	1 (0.3)	0 (0.4)	30 (2.3)	31 (2.1)
Nation	0 (0.0)	1 (0.4)	1 (0.3)	1 (0.2)	24 (2.2)	30 (1.7)
Some college						
State	0 (0.0)	0 (0.3)	0 (0.3)	0 (0.7)	15 (2.0)	20 (2.1)
Nation	0 (0.0)	1 (0.7)	0 (0.4)	0 (0.4)	14 (2.1)	19 (1.3)
High school graduate						
State	0 (0.0)	0 (0.2)	0 (0.4)	0 (0.0)	7 (1.7)	11 (1.5)
Nation	0 (0.0)	0 (0.2)	0 (0.0)	0 (0.0)	8 (1.3)	9 (1.0)
High school non-graduate						
State	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.2)	6 (2.1)
Nation	0 (0.0)	0 (0.0)	0 (0.2)	0 (0.0)	3 (1.1)	6 (1.6)
I don't know						
State	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.3)	6 (2.5)	8 (2.7)
Nation	0 (0.0)	0 (0.0)	0 (0.1)	0 (0.1)	5 (1.6)	8 (1.2)
GENDER						
Male						
State	0 (0.0)	1 (0.3)	0 (0.3)	0 (0.2)	19 (1.8)	23 (1.6)
Nation	0 (0.0)	1 (0.4)	1 (0.3)	0 (0.2)	16 (1.4)	19 (1.2)
Female						
State	0 (0.0)	0 (0.2)	0 (0.2)	0 (0.2)	13 (1.3)	17 (1.8)
Nation	0 (0.0)	0 (0.1)	1 (0.2)	0 (0.2)	13 (1.1)	18 (1.3) >

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TABLE S1 (continued) | Levels of Fourth-Grade and Eighth-Grade Public-School Mathematics Proficiency

	Level 250			Level 200		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students			Percentage of Students		
TOTAL						
State	20 (1.4)	69 (2.0)	73 (1.6)	77 (1.5)	97 (0.6)	98 (0.6)
Nation	16 (0.9)	64 (1.4)	67 (1.1)	71 (1.0)	95 (0.7)	96 (0.4)
RACE/ETHNICITY						
White						
State	25 (1.4)	77 (1.3)	79 (1.4)	86 (1.3)	99 (0.4)	99 (0.3)
Nation	21 (1.3)	73 (1.6)	78 (1.2)	82 (1.1)	98 (0.5)	99 (0.2)
Black						
State	2 (0.8)	35 (4.6)	33 (5.7)	39 (4.1)	91 (2.3)	88 (3.1)
Nation	2 (0.7)	34 (3.2)	32 (2.3)	38 (2.4)	86 (2.8)	88 (1.7)
Hispanic						
State	7 (2.3)	27 (5.6)	44 (5.1)!	54 (3.5)	77 (5.3)	91 (4.1)!
Nation	4 (0.9)	43 (4.0)	44 (2.1)	49 (2.2)	89 (2.0)	91 (1.4)
TYPE OF COMMUNITY						
Advantaged urban						
State	35 (5.6)!	88 (2.5)!	86 (5.6)!	89 (3.2)!	100 (0.1)!	100 (0.0)!
Nation	39 (4.2)!	83 (4.5)!	83 (3.6)!	90 (2.7)!	99 (1.5)!	99 (0.8)!
Disadvantaged urban						
State	4 (1.4)	44 (6.5)!	43 (6.4)!	43 (4.5)	89 (2.4)!	90 (3.2)!
Nation	3 (1.0)	49 (5.0)!	34 (3.1)	42 (4.1)	92 (2.2)!	87 (2.7)
Extreme rural						
State	23 (2.6)!	74 (4.1)!	80 (3.5)!	87 (1.4)!	98 (1.5)!	99 (0.5)!
Nation	14 (2.5)	58 (6.8)!	71 (5.7)!	71 (5.1)	95 (2.7)!	98 (1.1)!
Other						
State	21 (1.6)	72 (2.0)	79 (1.4)	82 (1.7)	98 (0.6)	99 (0.3)
Nation	16 (1.0)	64 (1.9)	69 (1.5)	73 (1.2)	95 (1.1)	97 (0.4)
PARENTS' EDUCATION						
College graduate						
State	28 (2.4)	81 (2.4)	83 (1.5)	84 (2.0)	99 (0.5)	99 (0.6)
Nation	23 (1.6)	76 (1.8)	78 (1.3)	78 (1.2)	97 (0.5)	98 (0.5)
Some college						
State	35 (3.6)	78 (2.4)	79 (2.3)	87 (2.1)	99 (0.9)	99 (0.6)
Nation	19 (2.8)	70 (1.8)	73 (1.5)	77 (3.1)	97 (1.4)	98 (0.8)
High school graduate						
State	15 (2.2)	59 (2.6)	66 (2.3)	77 (2.5)	96 (1.2)	97 (1.0)
Nation	11 (1.9)	57 (2.4)	57 (2.1)	67 (2.3)	95 (1.3)	95 (1.0)
High school non-graduate						
State	7 (2.4)	52 (4.9)	52 (4.6)	66 (5.3)	91 (3.5)	95 (1.8)
Nation	5 (2.2)	39 (3.6)	46 (3.5)	55 (4.4)	93 (2.1)	94 (1.3)
I don't know						
State	13 (1.6)	45 (6.5)	51 (6.0)	69 (2.7)	88 (4.2)	93 (3.1)
Nation	11 (1.0)	40 (3.4)	49 (2.6)	66 (1.2)	85 (3.4)	93 (1.2)
GENDER						
Male						
State	22 (1.8)	71 (2.1)	75 (1.8)	78 (1.8)	97 (0.7)	98 (0.7)
Nation	18 (1.0)	64 (2.0)	66 (1.3)	72 (1.2)	95 (0.9)	96 (0.6)
Female						
State	19 (1.4)	67 (2.7)	71 (2.1)	76 (2.0)	96 (0.8)	97 (0.7)
Nation	15 (1.2)	63 (1.6)	67 (1.3)	70 (1.4)	95 (0.8)	97 (0.5)

The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic.

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DATA APPENDIX

For each of the tables in the main body of the report that presents mathematics proficiency results, this appendix contains corresponding data for each level of the four reporting subpopulations -- race/ethnicity, type of community, parents' education level, and gender.

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TABLE A16 | Eighth-Grade Students' Reports on the Mathematics Class They Are Taking

	Eighth-grade Mathematics		Pre-algebra		Algebra	
	1990 Grade 8	1992 Grade 8	1990 Grade 8	1992 Grade 8	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	49 (2.5)	42 (2.5)	24 (2.2)	27 (2.4)	25 (1.6)	27 (1.7)
	248 (1.6)	256 (1.7) >	275 (1.5)	271 (2.0)	296 (1.6)	296 (1.9)
Nation	62 (2.1)	50 (2.9) <	19 (1.9)	28 (2.5) >	15 (1.2)	19 (1.2)
	251 (1.4)	253 (1.5)	271 (2.6)	271 (1.7)	298 (2.4)	299 (2.0)
RACE/ ETHNICITY						
White						
State	45 (2.5)	42 (2.7)	25 (2.5)	28 (2.6)	27 (1.5)	28 (1.5)
	254 (1.4)	262 (1.6) >	279 (1.4)	275 (1.9)	299 (1.4)	301 (1.9)
Nation	59 (2.5)	46 (3.5) <	21 (2.4)	30 (2.9)	17 (1.5)	21 (1.5)
	259 (1.6)	264 (1.5)	276 (2.4)	277 (1.3)	302 (2.4)	306 (1.8)
Black						
State	65 (5.2)	46 (3.7) <	16 (4.0)	23 (5.1)	16 (4.4)	25 (5.8)
	229 (1.9)!	227 (4.1)	*** (**.*)	238 (4.6)!	*** (**.*)	258 (6.6)!
Nation	72 (4.7)	60 (4.1)	16 (3.0)	23 (3.9)	9 (2.2)	13 (1.9)
	234 (3.3)	229 (1.4)	246 (6.3)	246 (3.3)	*** (**.*)	257 (5.0)
Hispanic						
State	69 (4.2)	59 (6.5)!	21 (3.9)	20 (4.6)!	8 (2.7)	16 (4.6)!
	223 (5.0)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	75 (4.4)	64 (3.2)	13 (3.9)	20 (2.7)	6 (1.5)	11 (1.2)
	238 (2.7)	239 (1.6)	*** (**.*)	255 (2.9)	*** (**.*)	273 (5.5)
TYPE OF COMMUNITY						
Adv. urban						
State	32 (8.2)!	16 (10.9)!	37 (7.4)!	42 (13.1)!	28 (4.2)!	41 (14.3)!
	266 (3.1)!	*** (**.*)	284 (2.9)!	*** (**.*)	317 (2.3)!	*** (**.*)
Nation	55 (9.4)!	41 (6.9)!	22 (7.9)!	25 (4.7)!	21 (4.4)!	29 (5.4)!
	270 (3.1)!	268 (5.3)!	*** (**.*)	282 (3.2)!	*** (**.*)	317 (2.9)!
Disadv. urban						
State	65 (6.7)!	43 (5.5)!	15 (5.2)!	26 (5.1)!	17 (3.6)!	28 (5.6)!
	232 (3.6)!	228 (5.3)!	*** (**.*)	251 (6.2)!	*** (**.*)	268 (5.3)!
Nation	65 (6.0)!	66 (3.5)	16 (4.1)!	14 (3.4)	14 (3.3)!	16 (2.3)
	241 (4.2)!	230 (2.2)	*** (**.*)	251 (3.4)!	291 (6.1)!	267 (6.2)!
Extreme rural						
State	49 (7.8)!	47 (7.5)!	18 (6.5)!	20 (7.2)!	32 (3.4)!	33 (5.5)!
	252 (4.3)!	262 (4.5)!	*** (**.*)	*** (**.*)	*** (**.*)	302 (5.0)!
Nation	74 (4.5)!	50 (8.9)!	14 (5.0)!	37 (9.2)!	7 (2.2)!	10 (3.1)!
	250 (3.6)!	263 (5.4)!	*** (**.*)	267 (8.8)!	*** (**.*)	*** (**.*)
Other						
State	48 (3.1)	45 (3.4)	23 (2.9)	27 (3.1)	26 (2.2)	24 (2.5)
	251 (1.8)	263 (1.6) >	275 (2.1)	277 (2.1)	295 (1.6)	300 (2.7)
Nation	61 (2.2)	48 (3.5) <	20 (2.1)	28 (3.0)	16 (1.4)	20 (1.3)
	251 (2.0)	255 (1.8)	272 (2.9)	272 (1.5)	296 (2.8)	299 (2.2)

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TABLE A16
(continued)

Eighth-Grade Students' Reports on the Mathematics Class They Are Taking

	Eighth-grade Mathematics		Pre-algebra		Algebra	
	1990 Grade 8	1992 Grade 8	1990 Grade 8	1992 Grade 8	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	49 (2.5)	42 (2.5)	24 (2.2)	27 (2.4)	25 (1.6)	27 (1.7)
	248 (1.6)	256 (1.7) >	275 (1.5)	271 (2.0)	296 (1.6)	296 (1.9)
Nation	62 (2.1)	50 (2.9) <	19 (1.9)	28 (2.5) >	15 (1.2)	19 (1.2)
	251 (1.4)	253 (1.5)	271 (2.6)	271 (1.7)	298 (2.4)	299 (2.0)
PARENTS EDUCATION						
College grad						
State	34 (3.0)	30 (2.7)	27 (2.7)	28 (2.7)	37 (2.4)	39 (2.2)
	256 (2.4)	262 (2.7)	282 (2.1)	278 (2.0)	304 (1.9)	301 (2.0)
Nation	53 (2.7)	39 (3.0) <	21 (2.3)	29 (2.7)	24 (1.7)	29 (2.0)
	259 (1.8)	261 (2.3)	278 (3.0)	277 (1.7)	305 (2.4)	306 (1.9)
Some college						
State	45 (2.9)	38 (3.1)	24 (2.8)	30 (3.0)	28 (2.0)	29 (2.8)
	255 (2.4)	263 (2.1)	275 (2.4)	272 (3.1)	293 (2.0)	293 (3.4)
Nation	60 (3.1)	49 (3.9)	21 (2.9)	29 (3.3)	15 (1.9)	19 (1.5)
	258 (2.0)	259 (1.7)	275 (3.2)	272 (1.9)	298 (3.7)	300 (3.2)
HS graduate						
State	58 (3.0)	55 (3.1)	23 (2.6)	26 (3.1)	15 (1.6)	16 (1.6)
	245 (1.8)	253 (2.1) >	270 (2.4)	265 (2.6)	286 (2.6)	292 (3.0)
Nation	70 (2.6)	57 (3.6)	18 (2.4)	28 (3.5)	8 (1.1)	11 (1.1)
	249 (1.8)	248 (1.5)	266 (3.6)	265 (2.7)	277 (5.3)	281 (3.5)
HS non-grad						
State	71 (4.5)	56 (6.5)	17 (3.1)	23 (5.0)	10 (2.8)	15 (2.9)
	240 (3.7)	249 (2.6)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	77 (3.7)	64 (3.3)	13 (3.4)	23 (2.9)	3 (1.1)	6 (1.0)
	239 (2.0)	245 (2.5)	*** (**.*)	261 (4.6)	*** (**.*)	*** (**.*)
Don't know						
State	70 (4.9)	59 (4.4)	14 (4.1)	24 (3.9)	12 (2.9)	12 (2.4)
	235 (5.0)	247 (4.3)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	70 (3.5)	62 (2.7)	16 (3.4)	22 (3.1)	9 (2.0)	10 (1.7)
	235 (3.2)	244 (2.2)	*** (**.*)	264 (3.1)	*** (**.*)	281 (6.0)
GENDER						
Male						
State	48 (3.0)	45 (2.7)	25 (2.3)	27 (2.5)	24 (1.7)	25 (1.5)
	251 (1.6)	259 (2.0) >	277 (1.8)	276 (2.2)	301 (2.1)	299 (2.5)
Nation	63 (2.1)	50 (2.8) <	18 (1.8)	27 (2.7) >	15 (1.2)	18 (1.1)
	252 (1.7)	254 (1.5)	275 (3.1)	271 (1.9)	301 (2.8)	298 (2.3)
Female						
State	49 (2.7)	40 (2.6) <	22 (2.5)	28 (2.7)	26 (2.0)	30 (2.1)
	245 (2.0)	253 (1.8) >	273 (1.9)	266 (2.6)	292 (2.0)	294 (2.2)
Nation	61 (2.6)	49 (3.0) <	20 (2.3)	28 (2.5)	15 (1.7)	20 (1.5)
	251 (1.5)	253 (1.8)	268 (3.2)	271 (2.0)	295 (2.9)	300 (2.4)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. The percentages may not total 100 percent because a small number of students reported taking other or no mathematics classes. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A17A | Teachers' Reports on the Amount of Mathematics Homework Assigned Each Day

	None		15 Minutes		30 Minutes	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	1 (0.4)	0 (0.1)	53 (3.6)	33 (3.1)	44 (3.6)	60 (2.9)
	*** (**.*)	*** (**.*)	225 (1.7)	259 (2.4)	221 (2.2)	274 (2.0)
Nation	6 (1.4)	3 (0.7)	53 (2.1)	29 (2.1)	36 (2.6)	48 (2.6)
	220 (2.7)!	232 (4.1)!	220 (1.5)	262 (1.8)	215 (1.8)	267 (1.5)
RACE/ ETHNICITY						
White						
State	1 (0.5)	0 (0.1)	56 (4.0)	33 (3.1)	41 (4.0)	59 (3.1)
	*** (**.*)	*** (**.*)	230 (1.6)	264 (1.9)	229 (1.9)	280 (1.5)
Nation	8 (1.8)	2 (0.6)	57 (2.5)	30 (2.5)	32 (3.0)	48 (2.8)
	223 (2.7)!	239 (5.5)!	227 (1.4)	271 (1.7)	224 (2.0)	276 (1.8)
Black						
State	0 (0.0)	0 (0.0)	38 (4.9)	35 (9.1)	57 (4.7)	62 (8.7)
	*** (**.*)	*** (**.*)	194 (3.4)	230 (4.7)!	192 (3.8)	240 (6.3)
Nation	2 (0.8)	6 (2.7)	41 (4.0)	30 (3.8)	46 (3.6)	49 (4.8)
	*** (**.*)	*** (**.*)	193 (2.5)	231 (2.8)	192 (2.4)	238 (2.1)
Hispanic						
State	0 (0.0)	1 (1.3)!	54 (5.2)	32 (7.0)!	46 (5.2)	64 (7.4)!
	*** (**.*)	*** (**.*)	206 (3.8)	*** (**.*)	201 (3.7)	*** (**.*)
Nation	4 (1.5)	2 (0.9)	45 (2.4)	27 (3.1)	43 (2.8)	51 (4.0)
	*** (**.*)	*** (**.*)	198 (2.3)	244 (2.5)	199 (2.4)	247 (2.3)
TYPE OF COMMUNITY						
Adv. urban						
State	2 (1.8)!	0 (0.0)!	48 (15.1)!	17 (9.9)!	47 (15.1)!	56 (14.7)!
	*** (**.*)	*** (**.*)	240 (9.2)!	*** (**.*)	236 (8.3)!	*** (**.*)
Nation	5 (4.4)!	2 (1.5)!	53 (10.5)!	28 (8.5)!	41 (9.4)!	28 (6.8)!
	*** (**.*)	*** (**.*)	243 (5.5)!	277 (5.0)!	238 (4.7)!	288 (7.8)!
Disadv. urban						
State	0 (0.0)	0 (0.0)!	39 (6.9)	38 (8.9)!	58 (6.0)	59 (8.4)!
	*** (**.*)	*** (**.*)	191 (4.4)!	235 (6.3)!	197 (5.7)!	249 (7.3)!
Nation	0 (0.2)	8 (5.6)	35 (6.2)	30 (7.0)	56 (6.3)	44 (9.1)
	*** (**.*)	*** (**.*)	197 (4.4)!	230 (4.3)!	193 (3.8)!	243 (4.4)!
Extreme rural						
State	3 (2.4)!	0 (0.0)!	81 (6.7)!	29 (8.7)!	16 (6.5)!	66 (9.5)!
	*** (**.*)	*** (**.*)	229 (1.7)!	258 (6.0)!	*** (**.*)	283 (4.7)!
Nation	20 (7.3)	6 (3.6)!	49 (5.2)	21 (6.5)!	31 (4.7)	50 (9.1)!
	223 (5.7)!	*** (**.*)	214 (5.0)!	269 (8.3)!	211 (6.7)!	261 (5.5)!
Other						
State	0 (0.0)	0 (0.2)	51 (5.3)	32 (4.0)	47 (5.0)	60 (3.8)
	*** (**.*)	*** (**.*)	227 (2.2)	266 (2.1)	226 (2.3)	278 (1.9)
Nation	4 (1.0)	2 (0.5)	56 (2.6)	30 (2.3)	34 (2.9)	51 (2.6)
	217 (3.3)!	*** (**.*)	220 (1.7)	263 (2.0)	217 (1.9)	269 (1.7)

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TABLE A17A (continued) | Teachers' Reports on the Amount of Mathematics Homework Assigned Each Day

	None		15 Minutes		30 Minutes	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	1 (0.4) *** (**.*)	0 (0.1) *** (**.*)	53 (3.6) 225 (1.7)	33 (3.1) 259 (2.4)	44 (3.6) 221 (2.2)	60 (2.9) 274 (2.0)
Nation	6 (1.4) 220 (2.7)!	3 (0.7) 232 (4.1)!	53 (2.1) 220 (1.5)	29 (2.1) 262 (1.8)	36 (2.6) 215 (1.8)	48 (2.6) 267 (1.5)
PARENTS' EDUCATION						
College grad						
State	1 (0.6) *** (**.*)	0 (0.1) *** (**.*)	53 (3.9) 234 (2.2)	26 (3.0) 266 (3.0)	44 (4.0) 225 (3.4)	64 (3.0) 285 (1.9)
Nation	6 (1.7) 224 (3.7)!	2 (0.6) *** (**.*)	53 (2.7) 228 (2.1)	26 (2.4) 270 (2.2)	36 (3.2) 221 (2.5)	47 (3.0) 280 (2.2)
Some college						
State	0 (0.0) *** (**.*)	0 (0.2) *** (**.*)	56 (4.7) 235 (2.8)	37 (3.8) 265 (3.3)	42 (4.5) 236 (3.3)	55 (3.8) 278 (2.6)
Nation	6 (2.1) *** (**.*)	2 (0.8) *** (**.*)	50 (4.2) 223 (3.0)	29 (2.8) 264 (2.7)	38 (4.3) 224 (3.8)	48 (3.1) 269 (1.9)
HS graduate						
State	1 (0.8) *** (**.*)	1 (0.4) *** (**.*)	50 (4.0) 221 (2.1)	36 (3.7) 255 (2.9)	48 (4.3) 218 (2.4)	59 (3.8) 264 (2.2)
Nation	7 (2.3) *** (**.*)	3 (1.1) *** (**.*)	53 (3.5) 215 (2.9)	34 (2.9) 258 (2.4)	35 (4.4) 210 (3.1)	50 (3.2) 256 (1.8)
HS non-grad						
State	0 (0.0) *** (**.*)	0 (0.0) *** (**.*)	53 (6.9) *** (**.*)	43 (5.3) 247 (4.1)	46 (6.8) *** (**.*)	54 (5.2) 254 (4.0)
Nation	7 (3.6) *** (**.*)	5 (1.5) *** (**.*)	54 (4.3) 196 (3.3)	31 (3.4) 250 (2.7)	35 (3.7) 203 (4.8)	49 (3.8) 251 (2.2)
Don't know						
State	0 (0.2) *** (**.*)	1 (0.7) *** (**.*)	54 (4.3) 216 (2.4)	40 (4.9) *** (**.*)	43 (4.0) 215 (2.6)	57 (4.9) 254 (4.4)
Nation	6 (1.2) 216 (4.0)!	3 (1.4) *** (**.*)	53 (2.2) 215 (1.8)	28 (2.5) 245 (2.8)	37 (2.2) 210 (1.7)	53 (4.2) 252 (2.0)
GENDER						
Male						
State	0 (0.3) *** (**.*)	0 (0.2) *** (**.*)	54 (3.6) 226 (2.1)	35 (3.5) 261 (2.7)	43 (3.5) 222 (2.5)	58 (3.2) 277 (1.9)
Nation	7 (1.6) 220 (5.3)!	3 (0.9) 231 (4.6)!	52 (2.3) 222 (1.5)	32 (2.4) 261 (1.9)	36 (2.7) 214 (2.1)	47 (2.6) 268 (1.8)
Female						
State	1 (0.5) *** (**.*)	0 (0.1) *** (**.*)	52 (3.9) 224 (1.9)	31 (3.0) 257 (2.7)	45 (3.8) 220 (2.5)	62 (3.0) 270 (2.4)
Nation	6 (1.4) 220 (4.0)!	2 (0.6) *** (**.*)	53 (2.1) 218 (1.9)	27 (1.9) 262 (2.1)	36 (2.5) 215 (2.1)	50 (2.9) 267 (1.7)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). Comparisons between 1990 and 1992 are not possible for the teacher responses because of changes in the form of the questions that they were asked. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic.
*** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A17A (continued) | Teachers' Reports on the Amount of Mathematics Homework Assigned Each Day

	45 Minutes		An Hour or More	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL				
State	2 (0.8) *** (**.*)	6 (1.0) 298 (4.3)	0 (0.3) *** (**.*)	1 (0.5) *** (**.*)
Nation	4 (0.9) 200 (4.7)!	15 (2.0) 282 (3.8)	1 (0.4) *** (**.*)	4 (0.9) 286 (5.4)!
RACE/ ETHNICITY				
White				
State	1 (0.8) *** (**.*)	6 (1.1) 299 (4.5)	0 (0.3) *** (**.*)	1 (0.5) *** (**.*)
Nation	2 (0.7) 219 (5.0)!	16 (2.4) 290 (3.9)	0 (0.3) *** (**.*)	4 (1.1) 297 (4.9)!
Black				
State	5 (2.6) *** (**.*)	1 (1.1) *** (**.*)	0 (0.3) *** (**.*)	2 (1.2) *** (**.*)
Nation	8 (2.7) *** (**.*)	11 (2.1) 253 (6.9)!	3 (1.8) *** (**.*)	4 (1.3) *** (**.*)
Hispanic				
State	0 (0.4) *** (**.*)	3 (1.9)! *** (**.*)	0 (0.5) *** (**.*)	0 (0.0)! *** (**.*)
Nation	6 (1.9) *** (**.*)	15 (3.3) 247 (4.3)!	2 (0.8) *** (**.*)	4 (1.4) *** (**.*)
TYPE OF COMMUNITY				
Adv urban				
State	3 (3.4)! *** (**.*)	19 (5.8)! *** (**.*)	0 (0.0)! *** (**.*)	8 (9.1)! *** (**.*)
Nation	1 (1.1)! *** (**.*)	37 (9.9)! 288 (9.5)!	0 (0.0)! *** (**.*)	4 (2.2)! *** (**.*)
Disadv urban				
State	1 (1.3) *** (**.*)	1 (0.5)! *** (**.*)	2 (2.2) *** (**.*)	2 (2.1)! *** (**.*)
Nation	6 (3.5) *** (**.*)	7 (2.6) *** (**.*)	3 (2.6) *** (**.*)	5 (2.2) *** (**.*)
Extreme rural				
State	0 (0.0)! *** (**.*)	6 (4.0)! *** (**.*)	0 (0.0)! *** (**.*)	0 (0.0)! *** (**.*)
Nation	0 (0.0) *** (**.*)	17 (5.7)! 288 (9.0)!	0 (0.0) *** (**.*)	6 (5.1)! *** (**.*)
Other				
State	2 (1.1) *** (**.*)	6 (1.4) 295 (6.3)!	0 (0.0) *** (**.*)	1 (0.5) *** (**.*)
Nation	5 (1.3) 202 (4.5)!	14 (2.0) 280 (4.3)	1 (0.4) *** (**.*)	4 (0.9) 292 (5.7)!

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TABLE A17A (continued) | Teachers' Reports on the Amount of Mathematics Homework Assigned Each Day

	45 Minutes		An Hour or More	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		**Percentage of Students and Average Math Proficiency**	
TOTAL				
State	2 (0.8) *** (**.*)	6 (1.0) 298 (4.3)	0 (0.3) *** (**.*)	1 (0.5) *** (**.*)
Nation	4 (0.9) 200 (4.7)!	15 (2.0) 282 (3.8)	1 (0.4) *** (**.*)	4 (0.9) 286 (5.4)!
PARENTS' EDUCATION				
College grad.				
State	2 (0.9) *** (**.*)	8 (1.7) 303 (3.7)!	0 (0.1) *** (**.*)	2 (0.8) *** (**.*)
Nation	4 (1.1) 200 (6.0)!	19 (2.9) 294 (3.6)	1 (0.3) *** (**.*)	5 (1.2) 301 (5.0)!
Some college				
State	2 (1.1) *** (**.*)	6 (1.6) *** (**.*)	0 (0.4) *** (**.*)	1 (0.8) *** (**.*)
Nation	5 (1.9) *** (**.*)	16 (2.0) 282 (4.3)	1 (0.5) *** (**.*)	5 (1.6) *** (**.*)
HS graduate				
State	1 (0.8) *** (**.*)	4 (0.9) *** (**.*)	0 (0.2) *** (**.*)	1 (0.4) *** (**.*)
Nation	4 (1.3) *** (**.*)	11 (2.4) 259 (6.0)!	1 (0.5) *** (**.*)	3 (0.8) *** (**.*)
HS non-grad.				
State	0 (0.0) *** (**.*)	3 (1.5) *** (**.*)	1 (1.0) *** (**.*)	1 (0.7) *** (**.*)
Nation	4 (1.9) *** (**.*)	13 (3.2) 257 (5.2)!	0 (0.2) *** (**.*)	2 (0.5) *** (**.*)
Don't know				
State	2 (1.0) *** (**.*)	2 (1.2) *** (**.*)	1 (0.5) *** (**.*)	1 (0.8) *** (**.*)
Nation	3 (1.0) 196 (6.9)!	11 (2.5) *** (**.*)	1 (0.5) *** (**.*)	4 (1.3) *** (**.*)
GENDER				
Male				
State	1 (0.7) *** (**.*)	5 (1.0) 305 (3.7)	0 (0.3) *** (**.*)	1 (0.6) *** (**.*)
Nation	4 (1.0) 203 (6.4)!	14 (1.8) 282 (4.1)	1 (0.4) *** (**.*)	4 (0.9) 283 (6.8)!
Female				
State	2 (0.9) *** (**.*)	6 (1.3) 292 (5.8)!	0 (0.4) *** (**.*)	2 (0.6) *** (**.*)
Nation	4 (1.0) 198 (4.8)!	16 (2.4) 281 (4.8)	1 (0.4) *** (**.*)	4 (1.0) 289 (5.3)!

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). Comparisons between 1990 and 1992 are not possible for the teacher responses because of changes in the form of the questions that they were asked. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A17B | Students' Reports on the Amount of Time Spent on Mathematics Homework Each Day

	None			15 Minutes			30 Minutes		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	2 (0.4) 215 (5.4)	5 (0.5) 250 (4.2)	5 (0.6) 251 (3.6)	50 (1.6) 228 (1.7)	41 (1.1) 269 (1.6)	37 (1.4) 271 (1.5)	28 (1.1) 224 (1.5)	35 (0.7) 268 (1.9)	38 (1.2) 273 (1.8)
Nation	7 (0.7) 221 (2.4)	9 (0.8) 251 (2.9)	8 (0.4) 253 (2.4)	39 (1.1) 220 (1.2)	31 (2.0) 264 (1.7)	28 (0.8) 268 (1.4)	29 (0.8) 221 (1.1)	32 (1.2) 263 (1.9)	35 (0.7) > 268 (1.3)
RACE/ ETHNICITY									
White									
State	2 (0.5) *** (**.*)	5 (0.6) 255 (4.3)	4 (0.6) 256 (4.2)	50 (1.7) 235 (1.5)	42 (1.1) 273 (1.3)	37 (1.5) 276 (1.3)	30 (1.2) 230 (1.2)	35 (0.9) 273 (1.6)	38 (1.3) 278 (1.6)
Nation	8 (0.8) 228 (2.4)	10 (1.0) 258 (3.8)	8 (0.5) 263 (2.5)	40 (1.4) 229 (1.2)	33 (2.4) 271 (1.8)	28 (1.0) 277 (1.4)	29 (1.1) 228 (1.4)	32 (1.3) 270 (2.1)	36 (0.9) > 276 (1.5)
Black									
State	2 (0.5) *** (**.*)	5 (1.6) *** (**.*)	6 (1.8) *** (**.*)	51 (2.6) 196 (3.1)	35 (3.9) 242 (2.8)!	37 (3.4) 241 (5.9)	21 (1.7) 191 (3.8)	34 (2.9) 242 (3.8)	35 (3.6) 241 (3.9)
Nation	5 (0.8) *** (**.*)	7 (1.5) *** (**.*)	7 (1.1) 227 (4.3)	39 (1.8) 192 (1.7)	26 (2.5) 242 (4.2)	26 (1.7) 239 (2.5)	25 (1.4) 196 (2.0)	33 (2.7) 238 (3.5)	33 (2.3) 241 (2.2)
Hispanic									
State	5 (1.2) *** (**.*)	9 (3.7) *** (**.*)	11 (3.7)! *** (**.*)	48 (4.0) 209 (3.4)	33 (4.9) *** (**.*)	32 (4.8)! *** (**.*)	23 (2.4) *** (**.*)	33 (3.9) *** (**.*)	38 (4.8)! *** (**.*)
Nation	5 (0.9) *** (**.*)	12 (1.8) *** (**.*)	11 (1.4) 232 (5.1)	36 (2.0) 200 (1.9)	27 (3.0) 244 (3.7)	27 (1.8) 248 (2.1)	32 (1.6) 204 (1.8)	30 (2.6) 250 (3.4)	30 (1.5) 247 (1.7)
TYPE OF COMMUNITY									
Adv. urban									
State	1 (0.5)! *** (**.*)	2 (1.0)! *** (**.*)	1 (1.2)! *** (**.*)	58 (4.6)! 242 (4.9)!	44 (3.6)! 287 (2.9)!	25 (3.1)! < *** (**.*)	27 (3.2)! 234 (3.1)!	37 (3.6)! 292 (2.6)!	49 (4.9)! *** (**.*)
Nation	6 (2.3)! *** (**.*)	8 (2.5)! *** (**.*)	4 (1.1)! *** (**.*)	44 (4.2)! 241 (3.8)!	41 (12.5)! 278 (4.2)!	23 (3.6)! 280 (5.4)!	31 (3.0)! 245 (2.7)!	31 (6.6)! 281 (6.1)!	42 (3.1)! 288 (4.5)!
Disadv. urban									
State	4 (0.6) *** (**.*)	4 (1.4)! *** (**.*)	8 (1.5)! *** (**.*)	48 (3.3) 199 (3.5)	43 (3.9)! 254 (6.0)!	37 (4.1)! 249 (6.6)!	27 (2.5) 198 (5.2)!	32 (2.6)! 243 (5.7)!	35 (3.1)! 243 (3.8)!
Nation	4 (0.8) *** (**.*)	12 (3.7)! *** (**.*)	7 (1.2) *** (**.*)	39 (2.8) 195 (3.5)	24 (3.3)! 253 (5.8)!	31 (2.5) 241 (3.9)	27 (1.5) 198 (3.4)	31 (3.0)! 248 (5.2)!	33 (2.3) 246 (3.5)
Extreme rural									
State	4 (1.8)! *** (**.*)	5 (1.3)! *** (**.*)	3 (1.4)! *** (**.*)	45 (2.7)! 237 (2.0)!	44 (4.0)! 270 (4.2)!	36 (2.9)! 275 (3.9)!	31 (3.9)! 228 (3.0)!	31 (2.9)! *** (**.*)	35 (2.6)! 277 (5.5)!
Nation	9 (1.6) *** (**.*)	8 (2.3)! *** (**.*)	9 (1.7)! *** (**.*)	37 (3.0) 217 (3.7)	36 (4.6)! 262 (3.4)!	26 (4.2)! 277 (4.5)!	29 (1.9) 222 (3.5)	31 (2.9)! 254 (6.2)!	31 (2.6)! 269 (4.6)!
Other									
State	2 (0.4) *** (**.*)	6 (0.7) 250 (4.7)	4 (0.5) 251 (4.5)	50 (2.2) 230 (1.8)	39 (1.4) 269 (1.6)	37 (1.8) 276 (1.4) >	29 (1.4) 228 (1.7)	35 (1.0) 269 (2.1)	40 (1.5) 278 (2.0) >
Nation	7 (0.8) 223 (2.6)	9 (1.0) 249 (3.7)	8 (0.6) 256 (2.6)	39 (1.3) 221 (1.5)	30 (1.8) 264 (2.2)	28 (0.9) 270 (1.5)	29 (1.2) 220 (1.2)	32 (1.3) 264 (2.3)	35 (0.8) 269 (1.6)

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TABLE A17B (continued) | Students' Reports on the Amount of Time Spent on Mathematics Homework Each Day

	None			15 Minutes			30 Minutes		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	2 (0.4)	5 (0.5)	5 (0.6)	50 (1.6)	41 (1.1)	37 (1.4)	28 (1.1)	35 (0.7)	38 (1.2)
	215 (5.4)	250 (4.2)	251 (3.6)	228 (1.7)	269 (1.6)	271 (1.5)	224 (1.5)	268 (1.9)	273 (1.8)
Nation	7 (0.7)	9 (0.8)	8 (0.4)	39 (1.1)	31 (2.0)	28 (0.8)	29 (0.8)	32 (1.2)	35 (0.7) >
	221 (2.4)	251 (2.9)	253 (2.4)	220 (1.2)	264 (1.7)	268 (1.4)	221 (1.1)	263 (1.9)	268 (1.3)
PARENTS EDUCATION									
College grad.									
State	2 (0.5)	3 (0.6)	4 (0.8)	52 (2.0)	40 (1.8)	34 (1.8)	28 (1.4)	36 (1.5)	40 (1.6)
	*** (**.*)	*** (**.*)	*** (**.*)	234 (2.3)	282 (2.7)	279 (1.9)	232 (2.8)	284 (2.3)	285 (2.3)
Nation	7 (0.8)	7 (0.9)	6 (0.5)	41 (1.6)	31 (3.4)	28 (1.2)	29 (1.2)	31 (2.0)	35 (1.0)
	229 (3.3)	265 (3.5)	264 (3.6)	228 (1.7)	275 (1.8)	279 (2.1)	227 (1.4)	276 (2.6)	281 (2.0)
Some college									
State	1 (0.6)	6 (1.2)	4 (1.0)	52 (3.0)	39 (2.2)	36 (2.1)	29 (2.7)	35 (2.2)	41 (1.8)
	*** (**.*)	*** (**.*)	*** (**.*)	241 (3.4)	271 (1.9)	278 (2.8)	236 (3.2)	272 (2.7)	274 (2.4)
Nation	9 (2.2)	9 (1.2)	7 (0.9)	42 (2.8)	30 (2.7)	27 (1.5)	25 (2.7)	36 (2.1)	38 (1.9)
	*** (**.*)	*** (**.*)	266 (4.4)	223 (2.5)	267 (3.2)	274 (1.7)	225 (3.4)	265 (2.8)	268 (1.7)
HS graduate									
State	3 (1.0)	5 (0.9)	5 (0.9)	48 (2.1)	42 (2.0)	42 (2.3)	32 (2.5)	36 (1.4)	33 (2.0)
	*** (**.*)	*** (**.*)	*** (**.*)	225 (2.2)	261 (2.1)	264 (2.3)	222 (2.3)	257 (2.2)	264 (2.3)
Nation	6 (1.0)	10 (1.7)	9 (0.9)	37 (3.0)	33 (2.2)	26 (1.3)	31 (2.4)	31 (1.9)	38 (1.6)
	*** (**.*)	245 (4.2)	248 (5.0)	215 (2.3)	260 (3.0)	258 (2.5)	213 (3.2)	254 (2.4)	258 (1.9)
HS non-grad.									
State	3 (1.4)	8 (2.1)	9 (2.2)	45 (4.7)	47 (3.7)	35 (3.9)	30 (4.3)	29 (3.4)	38 (3.3)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	254 (3.5)	256 (3.7)	*** (**.*)	*** (**.*)	252 (4.5)
Nation	11 (3.7)	17 (3.0)	13 (1.7)	38 (3.0)	26 (3.3)	28 (2.3)	25 (2.9)	34 (4.4)	29 (1.9)
	*** (**.*)	*** (**.*)	234 (4.9)	203 (3.5)	245 (4.1)	250 (3.4)	208 (4.9)	245 (3.2)	252 (2.5)
Don't know									
State	2 (0.5)	12 (3.1)	8 (2.1)	49 (2.6)	38 (4.3)	33 (4.3)	27 (1.7)	27 (3.4)	37 (4.6)
	*** (**.*)	*** (**.*)	*** (**.*)	220 (2.4)	*** (**.*)	*** (**.*)	215 (2.1)	*** (**.*)	*** (**.*)
Nation	6 (0.9)	13 (2.0)	11 (1.6)	38 (1.6)	38 (3.0)	29 (2.0)	29 (1.4)	27 (2.7)	32 (2.3)
	212 (3.6)	*** (**.*)	243 (5.1)	213 (1.7)	246 (5.2)	255 (2.8)	218 (1.5)	242 (5.4)	255 (3.0)
GENDER									
Male									
State	3 (0.6)	7 (0.8)	7 (0.8)	52 (1.8)	44 (1.6)	41 (1.7)	27 (1.3)	30 (1.3)	35 (1.4)
	*** (**.*)	251 (4.1)	254 (4.0)	228 (1.9)	272 (2.0)	273 (1.9)	226 (1.9)	271 (2.2)	277 (1.7)
Nation	9 (0.9)	11 (1.1)	10 (0.6)	41 (1.6)	34 (2.4)	30 (0.9)	27 (1.2)	29 (1.3)	35 (1.0) >
	221 (2.9)	254 (3.4)	251 (2.7)	222 (1.4)	265 (2.6)	270 (1.6)	221 (1.7)	265 (2.5)	270 (1.6)
Female									
State	1 (0.4)	3 (0.6)	3 (0.6)	48 (1.9)	37 (1.3)	32 (1.7)	30 (1.4)	39 (1.2)	41 (1.6)
	*** (**.*)	*** (**.*)	*** (**.*)	228 (2.1)	265 (2.0)	269 (2.0)	223 (2.0)	265 (2.2)	270 (2.3)
Nation	5 (0.5)	7 (0.9)	6 (0.5)	38 (1.4)	28 (2.0)	25 (1.3)	31 (1.0)	35 (1.7)	35 (1.0)
	221 (3.6)	246 (4.9)	257 (3.7)	218 (1.5)	264 (1.9)	267 (2.0)	221 (1.3)	261 (2.1)	267 (1.6)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A17B (continued) | Students' Reports on the Amount of Time Spent on Mathematics Homework Each Day

	45 Minutes			An Hour or More		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**		
TOTAL						
State	10 (0.7)	11 (0.7)	14 (0.7) >	10 (0.7)	8 (0.6)	6 (0.8)
	215 (2.2)	264 (2.7)	275 (2.9) >	207 (2.2)	265 (3.6)	261 (4.4)
Nation	12 (0.5)	16 (1.0)	16 (0.6)	12 (0.7)	12 (1.1)	13 (0.7)
	217 (1.6)	266 (2.1)	269 (1.7)	204 (1.8)	258 (3.0)	265 (2.0)
RACE/ ETHNICITY						
White						
State	9 (0.7)	10 (0.7)	14 (0.8) >	9 (0.7)	7 (0.7)	6 (0.8)
	224 (2.1)	272 (2.2)	279 (2.8)	212 (1.9)	274 (3.1)	271 (4.6)
Nation	13 (0.6)	15 (0.9)	15 (0.6)	10 (0.8)	11 (1.3)	12 (0.8)
	225 (1.8)	278 (2.2)	281 (1.8)	214 (2.1)	268 (3.4)	277 (1.8)
Black						
State	14 (2.0)	14 (1.9)	13 (2.1)	12 (1.6)	11 (2.0)	9 (2.0)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	12 (0.9)	18 (2.3)	19 (1.5)	19 (1.6)	16 (1.9)	15 (1.5)
	190 (3.5)	241 (4.2)	236 (2.5)	185 (3.3)	233 (4.5)	231 (3.0)
Hispanic						
State	13 (2.4)	18 (2.9)	13 (2.8)!	11 (2.4)	7 (2.1)	6 (2.3)!
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	13 (1.3)	17 (2.1)	17 (1.4)	15 (1.2)	14 (1.7)	16 (1.3)
	199 (3.3)	238 (5.2)	246 (4.2)	190 (3.0)	*** (**.*)	246 (2.8)
TYPE OF COMMUNITY						
Adv. urban						
State	9 (1.7)!	10 (1.2)!	18 (2.6)!	6 (1.1)!	6 (1.1)!	8 (4.7)!
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	12 (2.0)!	12 (3.3)!	20 (1.4)!	7 (1.7)!	7 (3.4)!	12 (3.4)!
	*** (**.*)	*** (**.*)	285 (7.0)!	*** (**.*)	*** (**.*)	*** (**.*)
Disadv. urban						
State	11 (1.8)	12 (1.9)!	11 (1.5)!	11 (1.5)	9 (2.0)!	8 (2.1)!
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	14 (1.2)	20 (1.9)!	14 (1.5)	17 (1.6)	14 (2.2)!	15 (1.3)
	191 (4.3)	250 (6.0)!	235 (3.0)	186 (3.3)	*** (**.*)	232 (5.1)
Extreme rural						
State	11 (1.5)!	13 (3.7)!	20 (2.3)!	9 (1.3)!	7 (0.8)!	7 (2.5)!
	*** (**.*)	*** (**.*)	284 (6.5)!	*** (**.*)	*** (**.*)	*** (**.*)
Nation	12 (1.1)	18 (3.8)!	17 (1.5)!	12 (2.6)	7 (2.7)!	16 (4.1)!
	220 (4.1)	*** (**.*)	265 (6.3)!	197 (6.6)!	*** (**.*)	260 (5.1)!
Other						
State	9 (1.0)	11 (0.9)	13 (1.0)	11 (1.0)	8 (0.9)	5 (0.7)
	219 (3.4)	267 (3.0)	279 (3.0)	210 (2.2)	270 (3.6)	267 (4.4)
Nation	12 (0.6)	15 (1.1)	16 (0.7)	13 (0.9)	13 (1.1)	13 (0.5)
	218 (1.8)	268 (2.2)	271 (2.0)	206 (1.9)	258 (3.5)	268 (2.4)

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TABLE A17B (continued) | Students' Reports on the Amount of Time Spent on Mathematics Homework Each Day

	45 Minutes			An Hour or More		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL						
State	10 (0.7)	11 (0.7)	14 (0.7) >	10 (0.7)	8 (0.6)	6 (0.8)
	215 (2.2)	264 (2.7)	275 (2.9) >	207 (2.2)	265 (3.6)	261 (4.4)
Nation	12 (0.5)	16 (1.0)	16 (0.6)	12 (0.7)	12 (1.1)	13 (0.7)
	217 (1.6)	266 (2.1)	269 (1.7)	204 (1.8)	258 (3.0)	265 (2.0)
PARENTS' EDUCATION						
College grad						
State	9 (1.0)	14 (1.2)	15 (1.0)	9 (0.9)	8 (0.9)	7 (1.1)
	222 (3.6)	277 (4.2)	288 (3.2)	213 (3.8)	282 (4.1)	279 (6.1)
Nation	12 (0.8)	18 (1.2)	18 (1.0)	11 (0.9)	14 (1.9)	14 (0.9)
	222 (2.7)	279 (3.6)	281 (2.3)	208 (3.1)	271 (3.0)	277 (3.3)
Some college						
State	11 (2.1)	12 (1.3)	14 (1.5)	7 (1.3)	8 (1.3)	5 (1.2)
	*** (**.*)	*** (**.*)	275 (4.9)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	11 (1.8)	14 (1.8)	15 (1.4)	13 (2.0)	11 (1.5)	14 (1.2)
	*** (**.*)	274 (3.7)	268 (3.3)	*** (**.*)	*** (**.*)	274 (3.9)
HS graduate						
State	7 (1.2)	9 (1.2)	14 (1.4)	10 (1.8)	8 (1.0)	6 (1.0)
	*** (**.*)	248 (3.1)	265 (3.7) >	*** (**.*)	*** (**.*)	*** (**.*)
Nation	14 (1.9)	16 (1.4)	15 (1.0)	12 (1.3)	11 (1.5)	12 (1.3)
	213 (3.4)	256 (3.8)	256 (3.2)	202 (4.1)	245 (4.3)	251 (2.8)
HS non-grad						
State	6 (1.9)	9 (2.2)	12 (2.7)	17 (3.7)	7 (1.8)	6 (1.3)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	10 (1.8)	12 (2.5)	16 (2.1)	16 (2.1)	10 (2.2)	14 (1.5)
	*** (**.*)	*** (**.*)	255 (3.9)	*** (**.*)	*** (**.*)	246 (4.7)
Don't know						
State	11 (1.3)	12 (3.7)	11 (2.8)	10 (1.2)	10 (3.2)	11 (3.3)
	209 (3.3)	*** (**.*)	*** (**.*)	203 (3.1)	*** (**.*)	*** (**.*)
Nation	13 (0.7)	13 (2.2)	15 (1.9)	14 (0.9)	10 (2.1)	12 (1.8)
	212 (2.1)	*** (**.*)	251 (4.6)	199 (2.0)	*** (**.*)	245 (4.7)
GENDER						
Male						
State	10 (0.9)	12 (1.0)	12 (0.9)	8 (0.8)	7 (0.9)	6 (0.9)
	215 (2.8)	266 (3.8)	277 (3.9)	209 (3.3)	271 (4.8)	265 (6.6)
Nation	12 (0.9)	15 (1.2)	14 (0.7)	11 (0.7)	11 (1.4)	11 (0.9)
	217 (2.5)	264 (3.0)	267 (2.3)	207 (2.1)	258 (3.9)	262 (3.0)
Female						
State	10 (1.0)	11 (1.0)	16 (1.0) >	11 (1.0)	9 (0.8)	7 (1.0)
	216 (2.9)	261 (4.0)	273 (3.1)	205 (2.6)	261 (3.8)	258 (4.4)
Nation	13 (0.7)	17 (1.0)	19 (0.9)	14 (0.9)	13 (1.3)	15 (0.8)
	216 (2.1)	268 (2.6)	270 (2.0)	201 (2.2)	258 (3.2)	267 (2.1)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A18A | Teachers' Reports on the Emphasis Given to Numbers and Operations

	Heavy Emphasis		Little or No Emphasis	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL				
State	95 (1.3)	72 (2.6)	0 (0.0)	3 (0.8)
	221 (1.7)	270 (1.5)	*** (**.*)	306 (5.2)!
Nation	92 (1.3)	76 (1.9)	0 (0.1)	4 (0.8)
	214 (1.3)	269 (1.2)	*** (**.*)	283 (6.9)!
RACE/ ETHNICITY				
White				
State	96 (1.3)	74 (2.8)	0 (0.0)	3 (0.9)
	228 (1.6)	275 (1.5)	*** (**.*)	314 (3.2)!
Nation	92 (1.5)	75 (2.1)	0 (0.1)	3 (0.8)
	222 (1.3)	278 (1.3)	*** (**.*)	297 (5.5)!
Black				
State	89 (2.9)	61 (5.1)	0 (0.0)	4 (1.8)
	191 (3.1)	240 (2.8)	*** (**.*)	*** (**.*)
Nation	91 (1.8)	74 (4.7)	0 (0.2)	6 (3.0)
	188 (1.6)	244 (1.9)	*** (**.*)	*** (**.*)
Hispanic				
State	95 (2.1)	84 (5.0)!	0 (0.0)	1 (1.3)!
	200 (3.3)	247 (4.0)!	*** (**.*)	*** (**.*)
Nation	93 (1.7)	80 (2.6)	0 (0.0)	2 (0.7)
	195 (2.4)	248 (1.9)	*** (**.*)	*** (**.*)
TYPE OF COMMUNITY				
Adv. urban				
State	100 (0.0)!	44 (27.4)!	0 (0.0)!	24 (10.5)!
	238 (5.9)!	*** (**.*)	*** (**.*)	*** (**.*)
Nation	93 (2.4)!	89 (4.7)!	0 (0.0)!	6 (4.4)!
	240 (4.0)!	284 (4.8)!	*** (**.*)	*** (**.*)
Disadv. urban				
State	94 (2.1)	72 (7.2)!	0 (0.0)	4 (2.0)!
	193 (4.2)	249 (4.0)!	*** (**.*)	*** (**.*)
Nation	91 (3.8)	73 (7.3)	0 (0.0)	1 (1.0)
	192 (3.0)	243 (3.8)!	*** (**.*)	*** (**.*)
Extreme rural				
State	100 (0.0)!	81 (5.3)!	0 (0.0)!	3 (1.9)!
	227 (2.0)!	276 (4.2)!	*** (**.*)	*** (**.*)
Nation	94 (4.9)	90 (6.2)!	0 (0.0)	2 (2.3)!
	211 (4.8)!	271 (4.7)!	*** (**.*)	*** (**.*)
Other				
State	94 (2.1)	74 (3.9)	0 (0.0)	2 (0.6)
	224 (1.8)	276 (1.8)	*** (**.*)	*** (**.*)
Nation	91 (1.4)	73 (2.2)	0 (0.1)	4 (0.9)
	214 (1.4)	270 (1.4)	*** (**.*)	277 (6.7)!

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TABLE A18A (continued) | Teachers' Reports on the Emphasis Given to Numbers and Operations

	Heavy Emphasis		Little or No Emphasis	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		**Percentage of Students and Average Math Proficiency**	
TOTAL				
State	95 (1.3)	72 (2.6)	0 (0.0)	3 (0.8)
	221 (1.7)	270 (1.5)	*** (**.*)	306 (5.2)!
Nation	92 (1.3)	76 (1.9)	0 (0.1)	4 (0.8)
	214 (1.3)	269 (1.2)	*** (**.*)	283 (6.9)!
PARENTS' EDUCATION				
College grad				
State	95 (1.7)	67 (3.7)	0 (0.0)	6 (1.7)
	229 (2.4)	278 (2.1)	*** (**.*)	*** (**.*)
Nation	93 (1.2)	73 (2.2)	0 (0.1)	4 (0.9)
	221 (1.8)	281 (1.8)	*** (**.*)	299 (6.2)!
Some college				
State	96 (1.4)	73 (3.3)	0 (0.0)	2 (0.7)
	234 (2.8)	276 (2.0)	*** (**.*)	*** (**.*)
Nation	89 (2.5)	76 (2.3)	0 (0.0)	3 (0.9)
	219 (2.6)	272 (1.6)	*** (**.*)	*** (**.*)
HS graduate				
State	94 (1.9)	76 (2.9)	0 (0.0)	1 (0.4)
	218 (2.1)	265 (1.8)	*** (**.*)	*** (**.*)
Nation	92 (1.6)	76 (2.7)	0 (0.0)	3 (1.4)
	209 (2.3)	261 (1.6)	*** (**.*)	*** (**.*)
HS non-grad				
State	96 (2.0)	78 (3.3)	0 (0.0)	1 (0.7)
	208 (4.0)	255 (3.0)	*** (**.*)	*** (**.*)
Nation	92 (2.5)	81 (3.2)	0 (0.2)	2 (0.9)
	197 (3.5)	253 (2.2)	*** (**.*)	*** (**.*)
Don't know				
State	95 (1.3)	78 (4.1)	0 (0.0)	1 (0.6)
	212 (2.2)	257 (3.7)	*** (**.*)	*** (**.*)
Nation	92 (1.5)	81 (2.4)	0 (0.1)	3 (1.2)
	208 (1.5)	254 (2.1)	*** (**.*)	*** (**.*)
GENDER				
Male				
State	95 (1.5)	73 (2.9)	0 (0.0)	3 (0.7)
	222 (2.0)	274 (1.7)	*** (**.*)	*** (**.*)
Nation	92 (1.2)	74 (1.9)	0 (0.1)	4 (0.8)
	215 (1.4)	269 (1.4)	*** (**.*)	281 (6.4)!
Female				
State	95 (1.3)	71 (2.7)	0 (0.0)	4 (1.0)
	220 (1.9)	267 (1.7)	*** (**.*)	*** (**.*)
Nation	92 (1.4)	77 (2.2)	0 (0.1)	3 (0.9)
	212 (1.5)	270 (1.5)	*** (**.*)	287 (9.0)!

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). The percentages may not total 100 percent because the "Moderate Emphasis" category is not included. Comparisons between 1990 and 1992 are not appropriate for this content area because of changes in the form of the questions that the students' mathematics teachers were asked. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A18B | Teachers' Reports on the Emphasis Given to Measurement

	Heavy Emphasis			Little or No Emphasis		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**		
TOTAL						
State	13 (1.7) 232 (4.0)	15 (2.2) 252 (3.4)	11 (2.3) 257 (7.2)!	6 (1.6) 230 (6.9)!	43 (2.9) 275 (3.7)	25 (2.7) < 289 (4.0)
Nation	14 (1.7) 217 (2.6)	17 (3.0) 250 (4.8)	16 (2.0) 255 (3.0)	6 (1.2) 221 (3.8)!	33 (4.0) 272 (3.9)	15 (1.6) < 281 (3.4)
RACE/ ETHNICITY						
White						
State	13 (1.8) 241 (4.2)	15 (2.2) 257 (2.9)	10 (2.3) 267 (5.9)!	7 (1.8) 236 (4.8)!	44 (2.9) 282 (2.5)	25 (2.9) < 294 (3.6)
Nation	10 (1.6) 234 (2.5)	14 (3.4) 258 (5.8)!	14 (2.3) 266 (2.9)	6 (1.5) 231 (2.8)!	36 (4.7) 278 (4.3)	16 (2.1) < 291 (3.0)
Black						
State	16 (3.6) 196 (3.4)!	17 (8.0) *** (**.*)	20 (6.6) 222 (8.8)!	4 (3.5) *** (**.*)	40 (9.0) 229 (7.5)!	20 (4.9) 241 (6.4)!
Nation	25 (4.5) 196 (2.7)	25 (7.4) 231 (3.5)!	19 (4.1) 225 (3.0)!	5 (1.5) *** (**.*)	23 (5.7) 239 (6.6)!	13 (2.4) 229 (6.2)
Hispanic						
State	12 (3.2) *** (**.*)	15 (6.1) *** (**.*)	9 (3.6)! *** (**.*)	3 (1.9) *** (**.*)	34 (10.1) *** (**.*)	15 (6.0)! *** (**.*)
Nation	22 (4.2) 203 (4.0)!	23 (4.1) *** (**.*)	22 (2.8) 237 (4.6)	7 (2.3) *** (**.*)	34 (5.8) 250 (4.9)!	10 (2.1) < 251 (6.7)!
TYPE OF COMMUNITY						
Adv. urban						
State	7 (6.9)! *** (**.*)	9 (4.4)! *** (**.*)	0 (0.0)! *** (**.*)	5 (3.5)! *** (**.*)	45 (7.5)! 307 (5.6)!	81 (13.6)! 301 (7.1)!
Nation	4 (2.7)! *** (**.*)	9 (7.0)! *** (**.*)	8 (3.8)! *** (**.*)	3 (3.2)! *** (**.*)	40 (8.5)! *** (**.*)	28 (7.2)! 285 (8.5)!
Disadv. urban						
State	16 (5.0) 198 (5.2)!	14 (7.2)! *** (**.*)	16 (8.0)! 217 (8.6)!	7 (4.4) *** (**.*)	51 (12.6)! 247 (14.7)!	30 (7.1)! 252 (7.7)!
Nation	23 (5.4) 189 (3.7)!	39 (10.3)! 241 (7.8)!	13 (4.6) 232 (7.5)!	3 (1.7) *** (**.*)	21 (6.5)! *** (**.*)	19 (5.7) 249 (14.0)!
Extreme rural						
State	15 (6.8)! *** (**.*)	25 (9.6)! *** (**.*)	15 (5.4)! *** (**.*)	9 (3.5)! *** (**.*)	24 (4.8)! *** (**.*)	20 (8.1)! 301 (6.6)!
Nation	7 (3.4) 213 (7.9)!	6 (4.9)! *** (**.*)	15 (6.5)! *** (**.*)	2 (1.4) *** (**.*)	32 (11.7)! 259 (7.8)!	11 (6.8)! *** (**.*)
Other						
State	15 (2.9) 236 (3.8)!	16 (2.8) 251 (4.2)	11 (3.2) 271 (6.0)!	4 (2.2) *** (**.*)	43 (3.9) 276 (3.1)	20 (2.8) < 294 (5.2)
Nation	15 (2.0) 223 (3.3)	16 (3.9) 251 (6.0)!	17 (2.6) 255 (3.4)	8 (1.7) 222 (4.1)!	34 (5.3) 271 (4.1)	14 (1.9) < 283 (3.2)

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TABLE A18B (continued) | Teachers' Reports on the Emphasis Given to Measurement

	Heavy Emphasis			Little or No Emphasis		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL						
State	13 (1.7)	15 (2.2)	11 (2.3)	6 (1.6)	43 (2.9)	25 (2.7) <
	232 (4.0)	252 (3.4)	257 (7.2)!	230 (6.9)!	275 (3.7)	289 (4.0)
Nation	14 (1.7)	17 (3.0)	16 (2.0)	6 (1.2)	33 (4.0)	15 (1.6) <
	217 (2.6)	250 (4.8)	255 (3.0)	221 (3.8)!	272 (3.9)	281 (3.4)
PARENTS' EDUCATION						
College grad						
State	11 (2.0)	12 (2.3)	10 (2.6)	7 (2.3)	51 (3.3)	31 (3.5) <
	242 (6.2)	259 (5.8)	271 (8.5)!	232 (10.9)!	293 (3.9)	302 (3.7)
Nation	13 (1.9)	16 (3.3)	12 (1.8)	6 (1.3)	37 (3.8)	19 (1.9) <
	223 (4.1)	264 (5.9)!	269 (4.0)	227 (5.2)!	285 (3.9)	293 (3.8)
Some college						
State	15 (3.7)	13 (2.7)	9 (2.2)	4 (1.4)	45 (3.8)	25 (3.7) <
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	274 (4.3)	285 (5.5)
Nation	16 (2.6)	12 (2.7)	15 (2.2)	7 (2.0)	39 (5.5)	15 (2.3) <
	*** (**.*)	*** (**.*)	257 (5.5)	*** (**.*)	278 (4.4)	277 (5.1)
HS graduate						
State	13 (2.0)	19 (2.6)	13 (2.8)	5 (1.6)	36 (3.3)	19 (2.7) <
	*** (**.*)	249 (3.5)	250 (7.5)!	*** (**.*)	259 (3.9)	275 (4.7)
Nation	14 (2.6)	17 (3.9)	22 (3.1)	7 (1.4)	27 (5.0)	12 (1.7)
	213 (3.9)	251 (5.7)!	246 (4.7)	*** (**.*)	250 (4.5)!	268 (4.3)
HS non-grad						
State	15 (5.7)	23 (4.4)	12 (3.0)	8 (3.4)	30 (6.5)	15 (3.5)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	12 (2.3)	22 (5.3)	18 (2.9)	6 (1.9)	25 (5.3)	8 (2.5)
	*** (**.*)	*** (**.*)	244 (3.5)	*** (**.*)	*** (**.*)	*** (**.*)
Don't know						
State	15 (2.0)	17 (4.9)	18 (4.8)	5 (1.6)	37 (5.9)	18 (4.0)
	219 (4.1)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	14 (2.1)	24 (4.4)	19 (2.9)	6 (1.3)	26 (4.1)	14 (2.5)
	212 (3.0)	*** (**.*)	250 (3.8)	215 (4.8)!	*** (**.*)	264 (4.9)
GENDER						
Male						
State	14 (1.8)	16 (2.5)	11 (2.5)	7 (1.8)	43 (3.2)	23 (2.9) <
	235 (4.4)	256 (4.1)	263 (7.6)!	232 (7.4)!	281 (4.5)	294 (4.6)
Nation	14 (1.9)	17 (3.3)	15 (1.9)	6 (1.3)	32 (3.9)	16 (1.8) <
	217 (2.9)	256 (5.9)	259 (3.0)	223 (5.2)!	277 (4.4)	281 (3.6)
Female						
State	13 (1.7)	15 (2.3)	11 (2.3)	5 (1.5)	43 (3.1)	26 (2.8) <
	228 (5.3)	247 (4.1)	251 (7.6)!	*** (**.*)	269 (4.2)	284 (4.1)
Nation	13 (1.7)	17 (3.2)	17 (2.1)	6 (1.3)	35 (4.3)	15 (1.6) <
	218 (3.0)	243 (4.8)	251 (3.9)	217 (4.2)!	267 (3.8)	280 (4.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. The percentages may not total 100 percent because the "Moderate Emphasis" category is not included. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A18C | Teachers' Reports on the Emphasis Given to Geometry

	Heavy Emphasis			Little or No Emphasis		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL						
State	4 (1.2)	17 (2.7)	18 (2.8)	19 (2.5)	34 (3.0)	16 (2.0) <
	229 (6.0)!	260 (3.0)	263 (3.7)	218 (2.7)	269 (4.2)	270 (4.5)
Nation	6 (1.1)	28 (3.8)	18 (2.6)	22 (2.8)	21 (3.3)	11 (1.4) <
	212 (5.0)	259 (3.0)	263 (2.3)	217 (1.9)	264 (5.4)	264 (4.4)
RACE/ ETHNICITY						
White						
State	4 (1.3)	17 (3.1)	18 (3.0)	19 (2.9)	32 (2.9)	16 (2.0) <
	236 (6.0)!	265 (2.8)	268 (2.7)	223 (2.7)	277 (2.1)	276 (3.9)
Nation	4 (0.9)	27 (4.4)	15 (3.1)	24 (3.4)	22 (3.4)	10 (1.4) <
	227 (7.4)!	265 (3.2)	272 (2.8)!	222 (1.9)	273 (5.8)	278 (3.4)
Black						
State	5 (2.3)	17 (5.1)	18 (5.4)	16 (3.8)	43 (11.3)	15 (5.8)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	232 (8.8)!	*** (**.*)
Nation	13 (3.4)	33 (7.9)	22 (4.7)	17 (3.7)	24 (7.3)	14 (3.3)
	195 (4.5)!	242 (6.2)!	240 (3.3)!	196 (3.0)!	233 (6.0)!	226 (5.0)!
Hispanic						
State	3 (1.8)	16 (4.8)	14 (4.6)!	25 (4.8)	30 (9.9)	12 (4.2)!
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	11 (4.2)	27 (6.8)	24 (3.9)	20 (3.3)	16 (5.5)	11 (2.0)
	204 (6.0)!	*** (**.*)	250 (3.5)	200 (3.3)	*** (**.*)	234 (7.0)
TYPE OF COMMUNITY						
Adv. urban						
State	0 (0.0)!	27 (7.0)!	12 (10.6)!	9 (5.0)!	30 (4.8)!	4 (3.5)! <
	*** (**.*)	274 (7.2)!	*** (**.*)	*** (**.*)	298 (4.7)!	*** (**.*)
Nation	1 (0.8)!	38 (9.4)!	14 (6.9)!	24 (8.8)!	13 (3.2)!	13 (5.9)!
	*** (**.*)	268 (6.2)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Disadv. urban						
State	3 (1.9)	17 (6.8)!	11 (5.3)!	18 (4.6)	34 (11.0)!	23 (5.1)!
	*** (**.*)	*** (**.*)	*** (**.*)	200 (8.8)!	237 (12.7)!	242 (7.3)!
Nation	11 (4.0)	33 (11.8)!	24 (6.1)	19 (5.6)	18 (7.6)!	11 (2.8)
	189 (5.5)!	250 (6.3)!	241 (5.8)!	196 (3.3)!	*** (**.*)	240 (9.1)!
Extreme rural						
State	3 (2.9)!	13 (6.0)!	19 (7.2)!	32 (4.7)	52 (10.3)!	21 (8.1)!
	*** (**.*)	*** (**.*)	*** (**.*)	218 (3.9)!	269 (6.0)!	*** (**.*)
Nation	3 (1.9)	9 (6.1)!	7 (3.8)!	19 (5.8)	16 (7.9)!	5 (3.2)!
	*** (**.*)	*** (**.*)	*** (**.*)	219 (4.5)!	*** (**.*)	*** (**.*)
Other						
State	6 (2.2)	16 (3.7)	23 (3.8)	19 (4.0)	30 (3.3)	12 (2.0) <
	232 (6.2)!	260 (3.8)!	269 (2.8)	224 (3.8)!	274 (2.5)	277 (5.1)
Nation	6 (1.5)	28 (4.6)	18 (3.2)	23 (3.3)	24 (4.3)	12 (1.7)
	217 (5.9)!	258 (4.0)	264 (2.2)	217 (1.9)	264 (5.8)	266 (5.2)

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TABLE A18C (continued) | Teachers' Reports on the Emphasis Given to Geometry

	Heavy Emphasis			Little or No Emphasis		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL						
State	4 (1.2)	17 (2.7)	18 (2.8)	19 (2.5)	34 (3.0)	16 (2.0) <
	229 (6.0)!	260 (3.0)	263 (3.7)	218 (2.7)	269 (4.2)	270 (4.5)
Nation	6 (1.1)	28 (3.8)	18 (2.6)	22 (2.8)	21 (3.3)	11 (1.4) <
	212 (5.0)	259 (3.0)	263 (2.3)	217 (1.9)	264 (5.4)	264 (4.4)
PARENTS EDUCATION						
College grad						
State	4 (1.5)	16 (2.6)	18 (2.9)	17 (2.9)	40 (3.4)	17 (2.3) <
	*** (**.*)	268 (4.6)	269 (4.6)	223 (4.2)	282 (4.4)	284 (5.7)
Nation	6 (1.3)	26 (3.4)	17 (2.8)	22 (3.2)	21 (2.9)	13 (1.6)
	217 (5.4)!	269 (2.9)	271 (2.8)	223 (3.4)	279 (6.5)	279 (4.6)
Some college						
State	4 (1.8)	20 (3.5)	16 (3.2)	16 (3.2)	35 (4.0)	19 (3.2)
	*** (**.*)	261 (3.5)	270 (4.9)!	*** (**.*)	273 (3.7)	271 (4.4)
Nation	7 (2.0)	27 (5.0)	20 (4.0)	22 (2.7)	23 (4.1)	11 (1.7)
	*** (**.*)	259 (4.4)!	265 (3.0)!	*** (**.*)	271 (5.2)	259 (5.4)
HS graduate						
State	5 (1.6)	18 (3.3)	21 (3.2)	19 (3.7)	26 (3.0)	13 (2.0) <
	*** (**.*)	255 (4.1)	259 (4.6)	217 (6.3)!	255 (4.0)	258 (4.7)
Nation	6 (1.4)	27 (4.5)	17 (2.7)	29 (4.9)	24 (5.1)	9 (1.7)
	*** (**.*)	257 (3.7)	255 (3.3)	213 (2.6)	247 (4.2)!	252 (5.6)
HS non-grad						
State	2 (1.5)	18 (4.6)	15 (4.4)	29 (5.2)	33 (7.1)	12 (3.1)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	6 (2.0)	32 (6.3)	18 (2.4)	24 (4.7)	20 (6.7)	10 (2.7)
	*** (**.*)	*** (**.*)	252 (4.7)	*** (**.*)	*** (**.*)	*** (**.*)
Don't know						
State	3 (1.1)	11 (3.4)	18 (4.4)	21 (2.7)	36 (6.2)	20 (3.7)
	*** (**.*)	*** (**.*)	*** (**.*)	213 (3.2)	*** (**.*)	*** (**.*)
Nation	6 (1.3)	35 (6.7)	16 (3.2)	20 (2.8)	13 (2.1)	11 (2.4)
	207 (3.9)!	245 (6.1)!	253 (3.9)	214 (2.5)	*** (**.*)	*** (**.*)
GENDER						
Male						
State	3 (1.1)	17 (2.8)	18 (2.9)	19 (2.7)	34 (3.1)	15 (1.7) <
	*** (**.*)	262 (3.2)	265 (4.2)	217 (3.0)	270 (4.8)	274 (5.1)
Nation	6 (1.2)	29 (4.1)	17 (2.5)	22 (2.9)	20 (3.3)	11 (1.4)
	210 (5.1)	261 (4.0)	262 (2.8)	217 (2.4)	266 (6.7)	263 (4.9)
Female						
State	4 (1.4)	17 (2.7)	19 (2.9)	19 (2.6)	33 (3.2)	17 (2.5) <
	*** (**.*)	258 (3.8)	262 (3.9)	220 (3.2)	267 (4.2)	267 (4.7)
Nation	5 (1.2)	27 (3.9)	18 (2.8)	22 (2.9)	23 (3.5)	11 (1.7) <
	214 (6.2)!	257 (2.9)	263 (2.7)	217 (2.1)	262 (4.7)	266 (4.7)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. The percentages may not total 100 percent because the "Moderate Emphasis" category is not included. ! Interpret with caution — the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A18D | Teachers' Reports on the Emphasis Given to Data Analysis, Statistics, and Probability

	Heavy Emphasis		Little or No Emphasis	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL				
State	4 (1.1)	10 (2.3)	53 (4.1)	51 (3.1)
	226 (7.3)!	280 (4.7)!	219 (1.8)	273 (2.6)
Nation	7 (1.2)	11 (1.7)	52 (2.8)	30 (2.0)
	222 (4.2)	273 (4.8)	215 (1.4)	268 (2.6)
RACE/ ETHNICITY				
White				
State	4 (1.2)	10 (2.5)	53 (4.7)	53 (3.4)
	243 (7.0)!	288 (4.4)!	226 (1.5)	277 (2.2)
Nation	7 (1.2)	10 (2.0)	54 (3.3)	31 (2.2)
	232 (4.8)	286 (5.4)	223 (1.4)	277 (2.5)
Black				
State	8 (2.7)	11 (2.6)	56 (5.7)	37 (5.3)
	*** (**.*)	*** (**.*)	188 (3.0)	233 (6.3)!
Nation	6 (1.8)	11 (2.1)	52 (3.8)	24 (3.2)
	*** (**.*)	246 (8.2)	190 (2.4)	232 (4.4)
Hispanic				
State	4 (2.5)	10 (4.1)!	54 (6.7)	39 (7.4)!
	*** (**.*)	*** (**.*)	198 (3.9)	*** (**.*)
Nation	11 (3.4)	13 (1.8)	46 (4.6)	31 (3.8)
	205 (5.3)!	246 (4.3)	198 (2.6)	239 (4.1)
TYPE OF COMMUNITY				
Adv. urban				
State	6 (4.3)!	0 (0.0)!	26 (11.0)!	68 (28.5)!
	*** (**.*)	*** (**.*)	236 (7.1)!	*** (**.*)
Nation	2 (1.4)!	26 (7.9)!	56 (12.4)!	22 (7.9)!
	*** (**.*)	*** (**.*)	236 (3.7)!	*** (**.*)
Disadv. urban				
State	5 (2.2)	12 (6.6)!	59 (6.7)	34 (6.5)!
	*** (**.*)	*** (**.*)	195 (6.2)!	247 (9.2)!
Nation	9 (4.3)	18 (5.6)	47 (6.8)	23 (4.7)
	*** (**.*)	251 (6.2)!	197 (4.0)!	242 (8.9)!
Extreme rural				
State	4 (3.1)!	0 (0.0)!	80 (6.3)!	74 (8.9)!
	*** (**.*)	*** (**.*)	229 (2.2)!	274 (5.7)!
Nation	9 (4.3)	5 (3.3)!	55 (7.9)	45 (12.0)!
	*** (**.*)	*** (**.*)	212 (5.3)!	261 (4.9)!
Other				
State	4 (1.7)	11 (3.4)	49 (4.8)	48 (4.2)
	*** (**.*)	285 (4.8)!	221 (2.1)	275 (2.3)
Nation	7 (1.7)	9 (1.7)	52 (2.9)	29 (2.4)
	223 (4.6)!	269 (3.8)	216 (1.4)	270 (3.3)

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TABLE A18D (continued) | Teachers' Reports on the Emphasis Given to Data Analysis, Statistics, and Probability

	Heavy Emphasis		Little or No Emphasis	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL				
State	4 (1.1) 226 (7.3)!	10 (2.3) 280 (4.7)!	53 (4.1) 219 (1.8)	51 (3.1) 273 (2.6)
Nation	7 (1.2) 222 (4.2)	11 (1.7) 273 (4.8)	52 (2.8) 215 (1.4)	30 (2.0) 268 (2.6)
PARENTS' EDUCATION				
College grad				
State	5 (1.6) *** (**.*)	11 (2.9) 291 (4.2)!	47 (4.8) 225 (3.1)	51 (3.9) 287 (3.5)
Nation	8 (1.3) 229 (4.3)	12 (2.5) 287 (6.4)!	49 (3.8) 221 (2.2)	30 (2.2) 284 (3.4)
Some college				
State	4 (1.7) *** (**.*)	11 (3.0) *** (**.*)	52 (4.7) 237 (3.1)	51 (3.9) 274 (3.4)
Nation	7 (2.6) *** (**.*)	11 (1.6) 271 (5.0)	53 (4.0) 225 (2.6)	31 (2.7) 272 (3.7)
HS graduate				
State	5 (1.6) *** (**.*)	8 (1.9) *** (**.*)	56 (3.9) 219 (2.1)	51 (3.1) 262 (2.7)
Nation	6 (1.6) *** (**.*)	8 (1.5) 260 (4.7)	55 (3.6) 211 (2.4)	28 (2.7) 252 (4.2)
HS non-grad				
State	1 (1.0) *** (**.*)	9 (3.0) *** (**.*)	66 (6.2) 210 (4.2)	51 (4.9) 250 (4.6)
Nation	7 (2.5) *** (**.*)	14 (2.6) 252 (4.9)!	56 (5.4) 197 (3.0)	33 (3.4) 243 (4.3)
Don't know				
State	4 (1.1) *** (**.*)	7 (2.6) *** (**.*)	58 (4.8) 212 (2.1)	47 (5.0) *** (**.*)
Nation	7 (1.4) 213 (4.6)!	11 (2.5) 259 (7.2)!	54 (2.6) 212 (1.5)	28 (2.6) 247 (4.1)
GENDER				
Male				
State	5 (1.3) 225 (8.0)!	9 (2.3) 282 (5.1)!	53 (4.4) 221 (2.4)	51 (3.1) 275 (2.9)
Nation	8 (1.4) 219 (4.7)	10 (1.6) 275 (4.5)	52 (3.0) 217 (1.6)	30 (2.0) 267 (2.8)
Female				
State	4 (1.1) *** (**.*)	10 (2.3) 279 (5.4)!	53 (4.0) 217 (2.1)	51 (3.3) 270 (2.8)
Nation	6 (1.0) 226 (4.7)	11 (1.9) 272 (5.8)	53 (2.9) 214 (1.7)	29 (2.3) 269 (3.2)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). The percentages may not total 100 percent because the "Moderate Emphasis" category is not included. Comparisons between 1990 and 1992 are not appropriate for this content area because of changes in the form of the questions that the students' mathematics teachers were asked. ! Interpret with caution — the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

TABLE A18F | Teachers' Reports on the Emphasis Given to Algebra and Functions

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	Heavy Emphasis			Little or No Emphasis		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL						
State	2 (0.9) *** (**.*)	48 (2.8) 282 (2.1)	48 (2.5) 284 (2.2)	72 (3.1) 218 (1.7)	20 (2.3) 238 (2.5)	16 (2.1) 248 (4.2)
Nation	4 (1.1) 218 (4.3)!	46 (3.6) 275 (2.6)	46 (2.1) 282 (2.1)	65 (3.5) 215 (1.5)	20 (3.0) 244 (3.2)	13 (1.5) 241 (2.8)
RACE/ ETHNICITY						
White						
State	2 (1.0) *** (**.*)	50 (2.8) 286 (1.9)	49 (2.6) 288 (1.9)	69 (3.6) 226 (1.5)	17 (2.0) 245 (2.4)	15 (2.2) 253 (3.2)
Nation	3 (1.1) 232 (5.7)!	48 (4.2) 281 (3.2)	48 (2.4) 290 (2.3)	65 (4.5) 222 (1.4)	18 (2.8) 252 (3.4)	11 (1.4) 250 (3.3)
Black						
State	0 (0.0) *** (**.*)	38 (7.2) 253 (6.2)	46 (6.7) 252 (7.4)!	82 (4.3) 187 (3.0)	34 (10.2) 223 (4.2)!	17 (6.0) *** (**.*)
Nation	4 (1.6) *** (**.*)	39 (7.1) 255 (5.4)	40 (3.8) 251 (2.8)	65 (4.3) 192 (2.7)	27 (6.9) 227 (5.1)!	18 (4.1) 222 (4.4)!
Hispanic						
State	1 (1.5) *** (**.*)	28 (6.2) *** (**.*)	30 (7.2)! *** (**.*)	80 (3.9) 200 (4.0)	44 (5.9) *** (**.*)	23 (5.0)! *** (**.*)
Nation	6 (1.8) *** (**.*)	46 (5.9) 256 (4.6)!	40 (3.4) 257 (2.2)	62 (2.9) 198 (2.2)	18 (4.2) *** (**.*)	17 (3.0) 225 (3.2)
TYPE OF COMMUNITY						
Adv urban						
State	6 (6.5)! *** (**.*)	67 (4.8)! 294 (3.4)!	61 (5.3)! *** (**.*)	46 (14.1)! 236 (6.5)!	11 (2.1)! *** (**.*)	17 (11.0)! *** (**.*)
Nation	0 (0.0)! *** (**.*)	41 (8.9)! 297 (6.1)!	49 (7.2)! 302 (6.8)!	54 (10.6)! 239 (4.4)!	18 (5.3)! *** (**.*)	8 (3.5)! *** (**.*)
Disadv urban						
State	0 (0.0) *** (**.*)	30 (6.2)! 277 (9.8)!	52 (5.6)! 259 (7.5)!	85 (4.4) 192 (3.5)	39 (8.5)! 228 (6.5)!	14 (4.9)! *** (**.*)
Nation	2 (1.3) *** (**.*)	53 (11.8)! 257 (6.5)!	33 (6.9) 265 (3.8)!	63 (7.1) 197 (4.0)!	20 (9.4)! *** (**.*)	16 (6.2) 226 (4.3)!
Extreme rural						
State	0 (0.0)! *** (**.*)	69 (6.6)! 277 (2.9)!	43 (6.8)! 298 (4.6)! >	85 (6.1)! 226 (3.8)!	9 (5.8)! *** (**.*)	18 (5.0)! *** (**.*)
Nation	8 (4.1) *** (**.*)	33 (8.1)! *** (**.*)	39 (8.3)! 276 (8.7)!	68 (7.9) 208 (5.6)!	42 (16.0)! 240 (5.2)!	18 (4.0)! 244 (7.2)!
Other						
State	1 (0.7) *** (**.*)	48 (3.5) 281 (3.0)	48 (3.5) 287 (2.4)	74 (4.0) 223 (2.0)	17 (2.5) 242 (2.8)	15 (2.9) 255 (3.9)!
Nation	3 (1.3) 214 (4.3)!	47 (4.3) 276 (3.2)	48 (2.3) 281 (2.4)	65 (3.9) 217 (1.4)	17 (3.3) 245 (4.8)!	12 (1.6) 241 (3.4)

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TABLE A18E (continued) | Teachers' Reports on the Emphasis Given to Algebra and Functions

	Heavy Emphasis			Little or No Emphasis		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL						
State	2 (0.9)	48 (2.8)	48 (2.5)	72 (3.1)	20 (2.3)	16 (2.1)
	*** (**.*)	282 (2.1)	284 (2.2)	218 (1.7)	238 (2.5)	248 (4.2)
Nation	4 (1.1)	46 (3.6)	46 (2.1)	65 (3.5)	20 (3.0)	13 (1.5)
	218 (4.3)!	275 (2.6)	282 (2.1)	215 (1.5)	244 (3.2)	241 (2.8)
PARENTS' EDUCATION						
College grad.						
State	1 (0.9)	60 (3.4)	58 (2.6)	69 (4.0)	14 (2.2)	12 (2.1)
	*** (**.*)	292 (2.4)	294 (2.0)	225 (2.5)	242 (4.3)	252 (6.1)
Nation	3 (1.1)	50 (3.9)	55 (2.2)	61 (4.3)	18 (2.4)	9 (1.1) <
	*** (**.*)	288 (2.9)	293 (2.4)	222 (2.2)	248 (3.9)	250 (4.2)
Some college						
State	2 (1.2)	51 (3.7)	50 (2.7)	73 (3.8)	18 (2.9)	15 (2.1)
	*** (**.*)	283 (2.6)	284 (3.2)	230 (2.6)	249 (3.9)	256 (3.9)
Nation	7 (2.6)	48 (4.8)	49 (3.5)	69 (4.4)	17 (3.1)	12 (1.8)
	*** (**.*)	279 (2.6)	280 (3.1)	223 (2.8)	*** (**.*)	244 (4.8)
HS graduate						
State	1 (0.9)	41 (3.4)	40 (3.5)	74 (3.2)	22 (2.5)	18 (2.8)
	*** (**.*)	270 (3.5)	273 (3.2)	215 (2.6)	233 (3.5)	245 (4.8)
Nation	3 (1.4)	44 (4.8)	38 (2.5)	67 (4.9)	23 (3.9)	16 (2.1)
	*** (**.*)	266 (3.0)	269 (2.4)	210 (2.8)	240 (4.1)	237 (3.7)
HS non-grad.						
State	0 (0.0)	30 (4.6)	38 (5.3)	78 (5.9)	29 (4.8)	22 (3.3)
	*** (**.*)	*** (**.*)	260 (4.9)!	209 (4.3)	*** (**.*)	*** (**.*)
Nation	1 (0.7)	28 (5.2)	35 (4.1)	72 (4.9)	29 (6.9)	18 (2.8)
	*** (**.*)	*** (**.*)	259 (3.2)	198 (3.6)	*** (**.*)	230 (3.7)
Don't know						
State	2 (1.3)	27 (4.6)	35 (4.5)	72 (3.6)	37 (6.3)	29 (4.0)
	*** (**.*)	*** (**.*)	*** (**.*)	211 (2.5)	*** (**.*)	*** (**.*)
Nation	4 (1.1)	42 (6.0)	36 (3.1)	66 (3.2)	19 (4.9)	19 (2.7)
	210 (5.1)!	249 (5.1)	264 (3.2)	211 (1.6)	*** (**.*)	236 (3.8)
GENDER						
Male						
State	2 (1.3)	48 (3.0)	46 (2.7)	71 (3.6)	20 (2.5)	16 (2.3)
	*** (**.*)	282 (2.3)	285 (2.2)	218 (2.2)	236 (2.9)	248 (4.7)
Nation	4 (1.2)	44 (4.1)	44 (2.0)	63 (3.6)	22 (3.6)	15 (1.8)
	213 (4.6)!	277 (3.1)	281 (2.3)	215 (1.8)	243 (3.4)	240 (3.2)
Female						
State	1 (0.5)	49 (3.1)	51 (2.7)	73 (3.0)	20 (2.3)	15 (2.1)
	*** (**.*)	282 (2.4)	282 (2.9)	218 (2.1)	239 (3.2)	247 (4.4)
Nation	3 (0.9)	48 (3.6)	48 (2.5)	66 (3.5)	18 (2.9)	11 (1.3)
	224 (5.4)!	274 (2.6)	282 (2.3)	215 (1.8)	245 (4.3)	241 (3.3)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. The percentages may not total 100 percent because the "Moderate Emphasis" category is not included. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A19 | Teachers' Reports on the Availability of Resources

	All the Resources Needed			Most of the Resources Needed			Some or None of the Resources Needed		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**			**Percentage of Students and Average Math Proficiency**		
TOTAL									
State	10 (2.1)	19 (3.6)	20 (2.8)	56 (3.5)	52 (3.6)	51 (3.5)	33 (3.6)	29 (3.3)	29 (3.4)
	233 (4.1)	273 (3.7)	272 (2.8)	227 (1.7)	267 (2.0)	274 (2.0) >	215 (2.5)	260 (3.6)	263 (3.2)
Nation	11 (1.7)	13 (2.4)	13 (2.3)	52 (3.0)	56 (4.0)	53 (2.5)	37 (3.5)	31 (4.2)	33 (1.9)
	221 (2.8)	264 (3.7)	272 (3.4)	220 (1.3)	265 (2.0)	269 (1.1)	213 (2.0)	260 (3.1)	261 (1.5)
RACE/ ETHNICITY									
White									
State	12 (2.4)	21 (3.9)	21 (3.1)	59 (3.9)	56 (3.6)	53 (3.9)	29 (3.9)	23 (3.2)	26 (3.8)
	236 (4.0)!	275 (3.4)	277 (2.3)	231 (1.7)	271 (1.5)	278 (1.7) >	225 (2.0)	273 (2.5)	271 (2.6)
Nation	12 (2.0)	11 (2.5)	14 (3.0)	54 (3.8)	58 (4.6)	56 (3.4)	35 (4.5)	30 (4.6)	30 (2.4)
	229 (2.8)	275 (3.3)!	280 (4.7)!	228 (1.2)	271 (2.4)	278 (1.2)	222 (1.9)	266 (3.3)	274 (1.5)
Black									
State	4 (1.8)	9 (4.0)	15 (5.0)	37 (5.5)	26 (7.0)	33 (4.9)	59 (5.2)	65 (6.9)	52 (6.1)
	*** (**.*)	*** (**.*)	*** (**.*)	198 (2.5)	240 (6.4)!	237 (5.9)!	188 (3.9)	238 (4.3)!	238 (5.1)
Nation	11 (2.1)	15 (4.2)	9 (2.2)	46 (4.1)	52 (6.6)	48 (3.0)	43 (4.1)	33 (7.2)	43 (3.3)
	194 (4.0)!	241 (5.8)!	240 (5.5)!	193 (2.2)	244 (2.7)	238 (2.5)	190 (2.1)	234 (6.7)	234 (2.0)
Hispanic									
State	9 (3.5)	10 (3.4)	21 (9.8)!	52 (7.2)	53 (8.0)	47 (8.7)!	39 (8.0)	37 (7.0)	32 (5.4)!
	*** (**.*)	*** (**.*)	*** (**.*)	205 (4.6)	*** (**.*)	*** (**.*)	200 (3.9)	*** (**.*)	*** (**.*)
Nation	8 (1.5)	23 (7.6)	12 (1.8)	45 (3.2)	44 (4.9)	45 (2.7)	47 (3.3)	34 (7.7)	43 (2.7)
	208 (3.9)	243 (6.5)!	246 (4.3)	203 (1.8)	251 (3.9)	247 (2.6)	195 (2.4)	242 (4.8)!	243 (2.2)
TYPE OF COMMUNITY									
Adv urban									
State	18 (12.2)!	36 (10.1)!	0 (0.0)!	54 (17.4)!	42 (9.6)!	86 (16.3)!	28 (12.2)!	22 (11.4)!	14 (16.3)!
	248 (10.8)!	288 (4.5)!	*** (**.*)	237 (5.4)!	290 (3.6)!	286 (2.9)!	231 (12.4)!	261 (6.1)!	*** (**.*)
Nation	12 (6.0)!	38 (9.2)!	26 (7.2)!	57 (7.4)!	59 (8.9)!	48 (10.6)!	31 (8.8)!	3 (3.1)!	26 (10.5)!
	*** (**.*)	273 (8.6)!	284 (12.3)!	243 (4.2)!	286 (1.1)!	289 (5.6)!	236 (6.0)!	*** (**.*)	276 (3.5)!
Disadv urban									
State	2 (2.3)	9 (4.4)!	8 (4.0)!	50 (8.4)	31 (9.9)!	38 (8.9)!	48 (9.3)	60 (11.2)!	54 (9.3)!
	*** (**.*)	*** (**.*)	*** (**.*)	202 (4.6)!	256 (7.5)!	248 (8.1)!	186 (3.5)!	238 (5.9)!	243 (5.8)!
Nation	7 (2.8)	10 (6.8)!	11 (4.5)	38 (7.3)	40 (13.1)!	37 (6.5)	55 (7.6)	50 (14.5)!	52 (6.9)
	*** (**.*)	*** (**.*)	240 (8.0)!	190 (4.5)!	255 (6.1)!	243 (3.7)	198 (3.2)!	251 (5.4)!	238 (3.8)!
Extreme rural									
State	12 (6.3)!	17 (13.1)!	27 (11.8)!	64 (8.1)!	62 (13.0)!	57 (11.6)!	23 (8.6)!	21 (9.2)!	17 (7.1)!
	*** (**.*)	*** (**.*)	288 (7.2)!	228 (3.0)!	271 (4.7)!	275 (6.1)!	230 (3.2)!	*** (**.*)	*** (**.*)
Nation	12 (5.2)	2 (2.6)!	19 (11.9)!	51 (7.2)	54 (10.4)!	45 (12.4)!	37 (8.4)	43 (10.3)!	36 (8.3)!
	220 (14.3)!	*** (**.*)	262 (3.7)!	218 (2.8)!	260 (9.9)!	271 (5.7)!	210 (5.2)!	256 (7.4)!	265 (6.9)!
Other									
State	11 (2.9)	20 (5.2)	25 (4.5)	54 (5.7)	56 (5.2)	54 (4.8)	34 (6.0)	24 (4.0)	21 (4.3)
	227 (4.6)!	271 (4.8)!	272 (2.1)!	229 (2.1)	266 (1.4)	277 (1.8) >	222 (2.3)	268 (3.6)!	273 (3.9)!
Nation	11 (2.0)	11 (2.9)	11 (2.0)	53 (3.2)	58 (5.4)	57 (3.0)	36 (3.8)	31 (5.6)	32 (2.6)
	221 (2.7)	263 (3.7)!	276 (3.0)	221 (1.3)	264 (2.1)	269 (1.3)	214 (2.4)	262 (4.6)	263 (2.0)

(continued on next page)

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TABLE A19 (continued)

Teachers' Reports on the Availability of Resources

	All the Resources Needed			Most of the Resources Needed			Some or None of the Resources Needed		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	10 (2.1) 233 (4.1)	19 (3.6) 273 (3.7)	20 (2.8) 272 (2.8)	56 (3.5) 227 (1.7)	52 (3.6) 267 (2.0)	51 (3.5) 274 (2.0) >	33 (3.6) 215 (2.5)	29 (3.3) 260 (3.6)	29 (3.4) 263 (3.2)
Nation	11 (1.7) 221 (2.8)	13 (2.4) 264 (3.7)	13 (2.3) 272 (3.4)	52 (3.0) 220 (1.3)	56 (4.0) 265 (2.0)	53 (2.5) 269 (1.1)	37 (3.5) 213 (2.0)	31 (4.2) 260 (3.1)	33 (1.9) 261 (1.5)
PARENTS' EDUCATION									
College grad.									
State	13 (3.2) 243 (4.4)!	20 (3.7) 291 (4.0)	18 (2.9) 281 (3.1)	51 (4.1) 234 (2.2)	54 (3.9) 280 (2.7)	53 (4.2) 265 (1.9)	36 (4.2) 220 (3.6)	26 (3.7) 274 (4.1)	29 (4.2) 275 (3.9)
Nation	13 (2.1) 227 (3.3)	15 (2.9) 275 (4.9)!	14 (2.0) 285 (4.2)	54 (3.4) 227 (1.9)	56 (4.9) 277 (2.3)	55 (2.5) 282 (1.4)	34 (3.6) 220 (2.5)	30 (5.1) 273 (4.1)	30 (2.1) 273 (2.2)
Some college									
State	12 (3.2) *** (**.*)	15 (3.1) 278 (3.5)	23 (3.6) 275 (4.4)	57 (5.1) 241 (2.9)	55 (3.9) 271 (1.8)	48 (4.1) 278 (2.5)	31 (5.1) 224 (4.5)!	29 (4.0) 266 (3.5)	29 (4.3) 265 (3.4)
Nation	11 (2.5) *** (**.*)	13 (3.3) *** (**.*)	11 (2.5) 274 (4.4)!	46 (3.9) 227 (3.0)	62 (4.3) 270 (2.1)	55 (3.4) 273 (1.6)	43 (4.5) 220 (3.3)	25 (4.1) 266 (4.6)	33 (2.8) 265 (2.3)
HS graduate									
State	8 (2.0) *** (**.*)	20 (4.4) 260 (4.1)!	21 (3.6) 265 (3.0)	60 (4.8) 223 (2.2)	51 (4.2) 257 (2.1)	51 (3.9) 265 (2.7)	32 (4.8) 213 (2.9)	29 (3.6) 252 (3.4)	28 (3.6) 255 (2.7)
Nation	10 (2.5) 214 (4.6)!	10 (2.5) 250 (4.6)!	13 (2.6) 262 (3.5)!	48 (3.7) 214 (2.2)	54 (4.9) 257 (2.2)	52 (3.0) 258 (1.8)	42 (4.9) 212 (2.8)	35 (4.9) 256 (3.4)	35 (2.3) 253 (2.1)
HS non-grad									
State	5 (2.0) *** (**.*)	22 (6.8) *** (**.*)	16 (5.0) *** (**.*)	63 (5.4) 214 (4.4)	48 (5.6) 249 (4.4)	52 (5.6) 257 (3.7)	32 (5.5) *** (**.*)	30 (5.6) *** (**.*)	29 (4.6) *** (**.*)
Nation	7 (1.8) *** (**.*)	8 (2.6) *** (**.*)	15 (5.9) 257 (3.8)!	48 (5.2) 204 (3.8)	54 (5.7) 245 (2.7)	48 (5.3) 250 (3.0)	44 (5.4) 199 (4.1)	38 (6.3) 238 (4.3)!	37 (3.8) 245 (2.4)
Don't know									
State	9 (2.0) 217 (3.7)!	20 (4.4) *** (**.*)	16 (3.6) *** (**.*)	59 (3.8) 219 (2.3)	39 (6.4) *** (**.*)	47 (4.5) *** (**.*)	33 (3.7) 208 (2.8)	42 (6.8) *** (**.*)	36 (4.2) *** (**.*)
Nation	10 (1.8) 216 (4.0)	17 (5.0) *** (**.*)	11 (2.6) 252 (4.4)!	52 (3.2) 215 (1.3)	52 (5.8) 244 (3.6)	48 (3.2) 254 (2.9)	38 (3.5) 207 (2.0)	31 (6.3) 236 (4.4)	41 (2.9) 247 (2.4)
GENDER									
Male									
State	10 (1.9) 231 (4.1)	21 (3.9) 275 (3.9)	19 (2.9) 275 (2.4)	57 (3.9) 227 (2.1)	52 (3.7) 268 (2.4)	53 (3.5) 277 (2.2) >	33 (3.8) 217 (2.8)	27 (3.1) 266 (3.6)	28 (3.7) 265 (3.3)
Nation	11 (1.8) 220 (3.2)	13 (2.6) 264 (4.0)!	13 (2.4) 272 (4.4)	51 (3.0) 221 (1.4)	57 (4.0) 265 (2.7)	53 (2.5) 268 (1.3)	38 (3.6) 215 (2.5)	30 (4.0) 263 (3.6)	34 (2.0) 263 (1.9)
Female									
State	11 (2.3) 234 (4.6)!	18 (3.5) 271 (4.3)	21 (3.0) 270 (3.5)	55 (3.3) 226 (1.9)	52 (3.7) 266 (1.9)	50 (3.8) 272 (2.2)	34 (3.5) 213 (2.8)	30 (3.7) 254 (4.2)	30 (3.3) 261 (3.6)
Nation	11 (1.7) 222 (3.2)	13 (2.4) 265 (4.0)	13 (2.3) 273 (3.3)	52 (3.1) 220 (1.6)	55 (4.4) 265 (1.9)	54 (2.7) 271 (1.4)	37 (3.5) 211 (2.0)	32 (4.7) 256 (3.2)	33 (2.1) 260 (1.7)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A20A | Teachers' Reports on the Frequency of Small-Group Work

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**			**Percentage of Students and Average Math Proficiency**		
TOTAL									
State	59 (3.5)	33 (3.3)	41 (3.7)	30 (3.2)	46 (3.2)	38 (3.3)	12 (2.3)	21 (3.2)	21 (2.6)
	225 (1.9)	265 (2.7)	269 (3.0)	221 (2.1)	268 (2.2)	274 (2.1)	219 (5.1)	268 (4.3)	267 (3.0)
Nation	65 (2.9)	50 (4.4)	51 (2.6)	27 (2.3)	43 (4.1)	32 (2.6)	8 (1.4)	8 (2.0)	17 (2.2) >
	218 (1.4)	260 (2.2)	269 (1.6) >	216 (1.8)	264 (2.5)	266 (2.2)	215 (3.0)	279 (5.5)!	267 (2.9)
RACE/ ETHNICITY									
White									
State	61 (3.6)	32 (3.1)	40 (4.1)	29 (3.5)	47 (3.4)	39 (3.5)	10 (2.0)	21 (3.3)	21 (2.7)
	232 (1.8)	271 (2.2)	277 (1.9)	228 (1.7)	273 (1.9)	278 (1.9)	229 (2.3)!	274 (2.4)	271 (2.9)
Nation	65 (3.5)	49 (4.6)	51 (2.7)	26 (2.9)	43 (4.5)	32 (2.9)	8 (1.6)	8 (2.3)	17 (2.4)
	227 (1.3)	265 (2.8)	278 (1.6) >	223 (1.9)	271 (2.2)	275 (2.2)	224 (3.5)	288 (5.1)!	276 (2.7)
Black									
State	52 (8.8)	34 (8.7)	49 (6.8)	26 (6.5)	44 (10.0)	32 (5.6)	22 (8.1)	22 (10.1)	18 (6.0)
	191 (2.4)!	235 (5.9)!	229 (4.7)!	192 (3.7)!	241 (4.5)!	252 (7.4)	195 (8.4)!	*** (**.*)	*** (**.*)
Nation	67 (4.0)	47 (8.1)	52 (6.7)	25 (3.2)	45 (7.0)	30 (4.8)	7 (1.9)	9 (4.1)	18 (4.1)
	190 (1.8)	240 (3.6)	238 (2.6)	195 (3.4)	238 (5.5)	236 (2.6)	*** (**.*)	*** (**.*)	237 (3.6)!
Hispanic									
State	55 (5.9)	36 (8.6)	53 (9.1)!	35 (5.0)	44 (8.0)	31 (8.3)!	10 (3.5)	20 (6.0)	16 (5.0)!
	206 (3.1)	*** (**.*)	*** (**.*)	199 (3.5)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	62 (3.4)	64 (7.2)	54 (3.1)	27 (3.0)	32 (6.9)	30 (2.8)	11 (2.4)	4 (1.4)	16 (3.0) >
	200 (2.2)	245 (2.8)	246 (2.4)	200 (3.2)	247 (7.0)!	245 (2.3)	190 (5.3)!	*** (**.*)	246 (5.3)
TYPE OF COMMUNITY									
Adv urban									
State	70 (13.9)!	48 (8.5)!	50 (21.3)!	14 (7.4)!	31 (5.7)!	41 (25.4)!	15 (9.8)!	20 (6.5)!	9 (10.0)!
	243 (6.0)!	286 (4.4)!	*** (**.*)	*** (**.*)	291 (4.9)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	71 (6.3)!	39 (22.9)!	38 (6.8)!	26 (6.8)!	41 (17.9)!	42 (8.5)!	3 (1.9)!	20 (12.2)!	20 (5.7)!
	242 (4.7)!	*** (**.*)	295 (8.6)!	*** (**.*)	274 (6.9)!	279 (5.9)!	*** (**.*)	*** (**.*)	*** (**.*)
Disadv urban									
State	52 (10.7)	41 (12.2)!	39 (7.9)!	34 (9.8)	56 (11.2)!	46 (9.1)!	14 (7.4)	3 (2.2)!	15 (4.6)!
	193 (4.0)!	244 (11.9)!	231 (7.2)!	199 (7.6)!	252 (6.4)!	257 (5.5)!	191 (13.5)!	*** (**.*)	*** (**.*)
Nation	73 (5.4)	70 (11.7)!	49 (8.7)	14 (3.9)	21 (9.0)!	38 (7.9)	13 (4.1)	9 (8.5)!	13 (5.5)
	195 (3.9)!	249 (4.7)!	242 (4.0)!	192 (4.5)!	247 (10.9)!	239 (4.2)!	192 (5.2)!	*** (**.*)	244 (6.2)!
Extreme rural									
State	61 (9.9)!	37 (14.3)!	30 (11.5)!	24 (8.0)!	28 (10.6)!	32 (8.6)!	15 (6.8)!	35 (14.2)!	39 (9.3)!
	230 (2.9)!	270 (8.7)!	272 (13.6)!	230 (2.2)!	*** (**.*)	276 (5.6)!	*** (**.*)	271 (9.2)!	278 (6.3)!
Nation	66 (9.5)	35 (14.6)!	38 (12.6)!	22 (8.6)	56 (17.1)!	35 (12.5)!	12 (4.7)	9 (9.6)!	27 (11.8)!
	216 (5.5)!	255 (5.7)!	264 (11.5)!	210 (5.5)!	257 (8.0)!	265 (6.4)!	*** (**.*)	*** (**.*)	271 (6.8)!
Other									
State	55 (5.2)	29 (3.7)	44 (5.1)	34 (4.9)	49 (4.1)	34 (4.5)	11 (3.0)	22 (3.7)	23 (3.5)
	228 (2.0)	263 (2.9)	276 (2.1) >	224 (2.2)	269 (2.4)	277 (2.1)	224 (5.2)!	273 (3.3)!	270 (2.8)
Nation	63 (3.8)	50 (4.4)	55 (2.8)	29 (3.0)	44 (4.5)	30 (2.6)	8 (1.6)	6 (1.8)	16 (2.3) >
	219 (1.5)	259 (2.6)	269 (1.6) >	217 (1.9)	264 (2.7)	268 (2.3)	218 (2.7)!	278 (8.6)!	266 (3.3)

(continued on next page)

TABLE A20A (continued) | Teachers' Reports on the Frequency of Small-Group Work

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	59 (3.5)	33 (3.3)	41 (3.7)	30 (3.2)	46 (3.2)	38 (3.3)	12 (2.3)	21 (3.2)	21 (2.6)
	225 (1.9)	265 (2.7)	269 (3.0)	221 (2.1)	268 (2.2)	274 (2.1)	219 (5.1)	268 (4.3)	267 (3.0)
Nation	65 (2.9)	50 (4.4)	51 (2.6)	27 (2.3)	43 (4.1)	32 (2.6)	8 (1.4)	8 (2.0)	17 (2.2) >
	218 (1.4)	260 (2.2)	269 (1.6) >	216 (1.8)	264 (2.5)	266 (2.2)	215 (3.0)	279 (5.5)!	267 (2.9)
PARENTS' EDUCATION									
College grad									
State	59 (4.0)	30 (3.8)	41 (3.9)	27 (3.3)	46 (3.7)	41 (4.3)	14 (3.3)	24 (3.8)	17 (2.4)
	233 (2.6)	282 (2.9)	282 (3.2)	228 (2.7)	281 (3.1)	284 (2.3)	221 (7.3)!	281 (4.5)	275 (3.3)
Nation	67 (2.5)	46 (5.2)	53 (2.9)	25 (2.2)	43 (4.4)	31 (2.8)	7 (1.3)	11 (2.7)	16 (2.3)
	225 (2.0)	271 (2.9)	281 (2.1)	220 (2.4)	276 (3.1)	278 (2.6)	227 (4.2)	286 (5.1)!	281 (3.2)
Some college									
State	60 (4.9)	31 (3.8)	42 (5.0)	30 (4.3)	50 (4.2)	37 (4.5)	10 (2.7)	19 (3.2)	21 (3.5)
	236 (2.6)	270 (3.7)	271 (3.6)	235 (4.8)	271 (2.3)	277 (2.5)	*** (**.*)	273 (4.3)	275 (4.1)
Nation	64 (4.6)	51 (5.2)	52 (3.4)	27 (3.6)	42 (5.1)	30 (3.0)	8 (2.4)	7 (2.3)	18 (3.1)
	223 (2.8)	265 (2.6)	271 (1.9)	223 (4.4)	268 (3.5)	271 (2.7)	*** (**.*)	*** (**.*)	269 (3.3)
HS graduate									
State	56 (4.0)	35 (4.0)	40 (4.0)	32 (4.0)	45 (3.8)	36 (3.1)	12 (2.4)	20 (3.5)	24 (3.1)
	221 (2.6)	254 (2.7)	260 (3.1)	218 (3.1)	258 (2.4)	265 (2.4)	*** (**.*)	259 (4.4)	260 (3.3)
Nation	64 (4.6)	49 (4.8)	50 (3.4)	28 (3.8)	45 (5.1)	32 (3.0)	8 (2.1)	6 (2.5)	19 (2.5) >
	214 (2.8)	252 (2.9)	257 (1.8)	212 (2.6)	256 (2.8)	257 (2.1)	*** (**.*)	*** (**.*)	256 (3.8)
HS non-grad									
State	66 (5.2)	37 (6.8)	47 (6.0)	27 (4.7)	42 (6.4)	30 (4.5)	7 (2.8)	21 (5.9)	23 (4.9)
	210 (3.7)	*** (**.*)	250 (3.9)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	55 (6.7)	60 (6.4)	46 (3.6)	33 (5.3)	39 (6.5)	35 (4.7)	12 (4.4)	1 (1.4)	19 (3.5) >
	203 (4.4)	245 (3.3)	250 (2.7)	198 (4.6)	242 (4.3)!	247 (2.4)	*** (**.*)	*** (**.*)	254 (5.5)
Don't know									
State	59 (4.1)	34 (5.9)	33 (5.5)	31 (3.8)	49 (5.8)	45 (4.2)	9 (2.1)	16 (4.6)	22 (4.5)
	217 (2.6)	*** (**.*)	*** (**.*)	213 (2.6)	*** (**.*)	*** (**.*)	212 (5.9)!	*** (**.*)	*** (**.*)
Nation	64 (3.2)	54 (6.0)	49 (3.8)	27 (2.7)	39 (5.3)	37 (4.3)	9 (1.4)	7 (2.5)	14 (2.4)
	212 (1.4)	239 (5.8)	253 (2.3)	214 (2.3)	239 (4.5)	251 (3.6)	208 (3.6)	*** (**.*)	249 (4.0)
GENDER									
Male									
State	59 (3.7)	34 (3.5)	42 (4.1)	30 (3.4)	45 (3.1)	38 (3.4)	11 (2.4)	21 (3.3)	20 (2.8)
	227 (2.0)	265 (2.7)	272 (3.3)	221 (2.3)	271 (2.3)	276 (2.0)	218 (6.1)!	273 (5.0)	268 (3.3)
Nation	66 (2.9)	50 (4.5)	49 (2.7)	27 (2.4)	42 (4.0)	34 (2.8)	7 (1.2)	8 (2.1)	17 (2.2) >
	219 (1.6)	260 (3.1)	267 (1.9)	217 (2.2)	264 (3.3)	266 (2.4)	216 (3.9)	282 (4.9)!	268 (3.1)
Female									
State	59 (3.6)	32 (3.3)	40 (3.7)	29 (3.3)	47 (3.7)	39 (3.5)	12 (2.4)	22 (3.3)	21 (2.8)
	223 (2.4)	264 (3.4)	265 (3.2)	220 (2.7)	265 (2.6)	272 (2.6)	220 (4.9)!	264 (4.3)	265 (3.3)
Nation	64 (3.2)	50 (4.7)	53 (2.9)	26 (2.5)	43 (4.7)	29 (2.5) <	9 (1.7)	7 (2.1)	17 (2.3) >
	217 (1.7)	259 (2.2)	270 (1.8) >	214 (1.9)	263 (2.4)	266 (2.6)	215 (3.0)	276 (7.2)!	266 (3.3)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A20B | Students' Reports on the Frequency of Small-Group Work

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	38 (1.8)	17 (1.4)	32 (1.9) >	20 (1.1)	25 (1.5)	27 (1.3)	43 (1.8)	58 (2.2)	41 (2.1) <
	220 (2.2)	263 (3.0)	269 (2.4)	232 (1.7)	271 (2.1)	275 (1.9)	222 (1.6)	266 (1.9)	270 (1.6)
Nation	37 (1.1)	28 (2.5)	36 (1.3) >	19 (0.8)	28 (1.4)	26 (1.0)	44 (1.2)	44 (2.9)	38 (1.8)
	213 (1.1)	258 (2.7)	265 (1.5)	228 (1.6)	267 (1.9)	270 (1.4)	217 (0.9)	262 (1.5)	266 (1.3)
RACE/ ETHNICITY									
White									
State	36 (2.1)	16 (1.5)	31 (2.1) >	21 (1.2)	26 (1.6)	27 (1.4)	42 (2.1)	58 (2.5)	42 (2.4) <
	228 (2.2)	272 (2.6)	276 (1.7)	236 (1.6)	275 (1.9)	278 (1.6)	229 (1.4)	272 (1.4)	275 (1.6)
Nation	35 (1.4)	27 (2.9)	34 (1.6)	21 (1.0)	29 (1.7)	29 (1.3)	44 (1.5)	44 (3.5)	37 (2.2)
	223 (1.3)	268 (3.2)	276 (1.4)	233 (1.7)	271 (1.9)	277 (1.5)	225 (1.1)	271 (1.7)	276 (1.5)
Black									
State	39 (3.7)	16 (2.3)	40 (3.4) >	14 (2.1)	21 (4.0)	22 (3.8)	48 (3.7)	63 (4.0)	37 (3.0) <
	189 (2.9)	*** (**.*)	229 (3.7)	*** (**.*)	*** (**.*)	*** (**.*)	192 (3.6)	239 (4.4)	237 (3.4)
Nation	43 (1.9)	28 (3.0)	40 (2.3) >	12 (1.1)	24 (3.6)	20 (1.7)	45 (2.1)	48 (4.7)	40 (2.2)
	188 (1.6)	236 (3.0)	234 (2.3)	198 (3.5)	245 (4.9)	239 (3.0)	191 (2.0)	235 (3.5)	238 (1.6)
Hispanic									
State	46 (3.9)	31 (4.0)	34 (6.0)!	13 (2.5)	23 (4.1)	22 (5.6)!	42 (3.6)	46 (5.3)	44 (5.3)!
	199 (3.7)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	203 (3.0)	*** (**.*)	*** (**.*)
Nation	44 (1.6)	37 (5.2)	36 (1.6)	13 (1.3)	22 (3.6)	22 (1.8)	44 (1.9)	41 (5.0)	43 (2.3)
	194 (1.6)	241 (3.7)	244 (2.4)	209 (4.5)	249 (4.4)	249 (2.4)	202 (1.9)	240 (3.2)	244 (2.2)
TYPE OF COMMUNITY									
Adv. urban									
State	44 (8.4)!	23 (5.6)!	47 (17.5)!	20 (3.4)!	30 (4.1)!	33 (7.8)!	36 (6.9)!	47 (5.2)!	20 (12.9)!
	236 (4.7)!	290 (7.4)	*** (**.*)	241 (7.4)!	288 (4.6)!	*** (**.*)	237 (6.7)!	287 (2.9)!	*** (**.*)
Nation	27 (3.6)!	27 (13.9)!	27 (5.4)!	28 (4.1)!	33 (4.5)!	27 (4.7)!	45 (3.5)!	40 (13.4)!	46 (4.6)!
	236 (3.8)!	*** (**.*)	285 (11.8)!	253 (3.3)!	286 (5.7)!	279 (2.7)!	235 (3.7)!	281 (4.6)!	288 (4.0)!
Disadv. urban									
State	43 (3.5)	20 (4.0)!	35 (4.0)!	13 (1.9)	27 (4.2)!	18 (2.1)!	45 (3.3)	53 (4.8)!	48 (3.6)!
	192 (3.8)	*** (**.*)	240 (9.1)!	*** (**.*)	260 (6.4)!	*** (**.*)	196 (4.4)!	244 (6.0)!	247 (4.0)!
Nation	40 (1.9)	31 (5.7)!	42 (2.4)	14 (1.5)	20 (2.8)!	19 (2.2)	45 (2.5)	49 (6.3)!	39 (2.8)
	191 (3.5)	245 (3.3)!	236 (4.4)	201 (4.2)!	268 (8.4)!	243 (4.2)	193 (3.1)	246 (4.5)!	240 (2.8)
Extreme rural									
State	38 (5.5)!	25 (7.2)!	26 (6.2)!	18 (2.2)!	22 (3.9)!	23 (3.1)!	44 (5.1)!	53 (8.2)!	51 (6.4)!
	227 (3.8)!	*** (**.*)	275 (9.8)!	*** (**.*)	*** (**.*)	273 (5.3)!	230 (2.2)!	266 (6.4)!	279 (4.2)!
Nation	35 (3.4)	34 (10.8)!	37 (4.6)!	20 (2.6)	27 (3.8)!	27 (4.2)!	45 (4.5)	39 (11.6)!	36 (6.4)!
	213 (4.4)!	250 (6.8)!	264 (6.4)!	221 (4.3)	264 (3.5)!	275 (4.7)!	216 (3.6)!	256 (6.9)!	264 (5.3)!
Other									
State	34 (2.5)	14 (1.7)	31 (2.5) >	22 (1.7)	24 (2.0)	28 (2.0)	45 (2.5)	61 (3.2)	41 (3.0) <
	223 (2.1)	265 (2.8)	273 (2.0)	234 (2.0)	270 (2.4)	278 (1.9)	225 (2.1)	267 (1.8)	275 (1.8) >
Nation	38 (1.3)	27 (2.6)	36 (1.7)	18 (0.9)	28 (1.7)	27 (1.1)	44 (1.3)	45 (3.3)	38 (2.3)
	214 (1.4)	260 (3.3)	267 (1.6)	228 (1.7)	264 (2.1)	271 (1.5)	219 (1.2)	263 (2.0)	267 (1.7)

(continued on next page)

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TABLE A20B (continued)

Students' Reports on the Frequency of Small-Group Work

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	38 (1.8)	17 (1.4)	32 (1.9) >	20 (1.1)	25 (1.5)	27 (1.3)	43 (1.8)	58 (2.2)	41 (2.1) <
	220 (2.2)	263 (3.0)	269 (2.4)	232 (1.7)	271 (2.1)	275 (1.9)	222 (1.6)	266 (1.9)	270 (1.6)
Nation	37 (1.1)	28 (2.5)	36 (1.3) >	19 (0.8)	28 (1.4)	26 (1.0)	44 (1.2)	44 (2.9)	38 (1.8)
	213 (1.1)	258 (2.7)	265 (1.5)	228 (1.6)	267 (1.9)	270 (1.4)	217 (0.9)	262 (1.5)	266 (1.3)
PARENTS EDUCATION									
College grad									
State	38 (2.5)	17 (2.0)	33 (2.4) >	20 (1.6)	26 (1.7)	28 (1.8)	41 (2.2)	57 (2.6)	39 (2.5) <
	226 (3.1)	279 (3.8)	282 (3.3)	239 (2.6)	285 (3.1)	287 (2.2)	229 (2.3)	280 (2.2)	279 (2.2)
Nation	38 (1.6)	28 (3.0)	36 (2.0)	22 (1.4)	28 (1.9)	29 (1.3)	40 (1.6)	44 (3.6)	35 (2.4)
	219 (1.6)	270 (2.8)	275 (2.4)	235 (2.3)	278 (2.8)	279 (1.8)	225 (1.5)	276 (2.2)	282 (2.1)
Some college									
State	36 (3.8)	16 (2.2)	31 (2.8) >	23 (2.6)	26 (2.9)	27 (2.2)	40 (3.9)	58 (3.4)	42 (3.0) <
	232 (3.2)	268 (4.9)	274 (3.7)	*** (**.*)	273 (3.2)	273 (2.5)	237 (3.3)	271 (2.1)	274 (2.7)
Nation	35 (2.8)	27 (3.9)	37 (2.2)	17 (2.9)	27 (2.4)	25 (1.9)	48 (2.9)	46 (3.8)	38 (2.7)
	221 (3.0)	265 (3.3)	268 (1.9)	231 (5.7)	268 (3.8)	272 (2.3)	222 (2.3)	268 (2.2)	271 (2.0)
HS graduate									
State	37 (2.6)	16 (1.7)	31 (1.9) >	20 (2.1)	26 (2.0)	26 (1.7)	42 (2.7)	58 (2.5)	43 (2.1) <
	217 (2.8)	253 (3.2)	258 (2.7)	225 (3.6)	261 (2.6)	265 (2.1)	221 (2.5)	256 (2.0)	263 (2.2)
Nation	36 (2.5)	28 (3.0)	34 (1.5)	16 (1.5)	28 (1.8)	26 (1.6)	48 (2.2)	43 (3.4)	40 (2.0)
	207 (2.9)	252 (3.7)	255 (2.1)	221 (4.3)	262 (2.6)	260 (1.9)	213 (2.1)	252 (1.9)	254 (1.8)
HS non-grad									
State	45 (5.2)	20 (4.0)	38 (4.1) >	20 (4.2)	19 (3.2)	23 (3.2)	35 (4.9)	62 (3.8)	39 (5.1) <
	*** (**.*)	*** (**.*)	246 (4.9)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	251 (3.6)	252 (4.3)
Nation	35 (3.6)	29 (4.5)	36 (2.2)	13 (2.1)	29 (3.0)	19 (2.9)	53 (3.8)	42 (4.5)	45 (2.4)
	200 (3.8)	242 (3.9)	247 (2.7)	*** (**.*)	241 (3.6)	250 (2.7)	206 (3.3)	242 (2.8)	249 (2.3)
Don't know									
State	37 (1.9)	19 (4.2)	30 (4.1)	18 (1.2)	19 (3.4)	24 (3.6)	46 (2.3)	62 (4.4)	47 (5.1)
	214 (3.0)	*** (**.*)	*** (**.*)	226 (2.7)	*** (**.*)	*** (**.*)	213 (2.0)	244 (5.7)	*** (**.*)
Nation	37 (1.3)	31 (4.5)	35 (2.3)	17 (1.1)	21 (2.9)	22 (1.7)	45 (1.6)	48 (4.3)	43 (2.4)
	207 (1.3)	236 (6.3)	253 (2.7)	223 (2.1)	253 (4.0)	260 (3.3)	212 (1.2)	237 (3.4)	245 (2.4)
GENDER									
Male									
State	41 (2.2)	18 (1.5)	31 (1.9) >	19 (1.2)	25 (1.9)	27 (1.5)	41 (2.2)	57 (2.5)	41 (2.0) <
	221 (2.6)	264 (3.4)	271 (2.9)	231 (1.8)	274 (2.8)	277 (2.2)	224 (1.9)	269 (2.2)	273 (1.8)
Nation	38 (1.4)	31 (2.9)	35 (1.4)	18 (1.0)	28 (1.7)	27 (1.1)	44 (1.3)	41 (2.9)	38 (1.8)
	214 (1.2)	259 (3.3)	263 (1.6)	231 (2.2)	267 (2.6)	270 (1.8)	218 (1.2)	263 (2.0)	267 (1.8)
Female									
State	34 (1.9)	16 (1.5)	33 (2.4) >	21 (1.4)	25 (1.8)	26 (1.6)	45 (2.0)	59 (2.5)	41 (2.4) <
	219 (2.4)	262 (3.9)	266 (2.8)	233 (2.3)	269 (2.7)	273 (2.7)	220 (2.0)	262 (2.0)	266 (1.9)
Nation	36 (1.3)	26 (2.4)	36 (1.4) >	19 (1.0)	27 (1.8)	25 (1.2)	45 (1.5)	47 (3.2)	39 (1.9)
	212 (1.4)	257 (3.2)	266 (1.9) >	225 (2.0)	266 (2.1)	270 (1.5)	217 (1.1)	261 (1.6)	265 (1.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A21A | Teachers' Reports on the Use of Mathematical Objects

	At Least Weekly		Less Than Once a Week		Never or Hardly Ever	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	33 (3.5)	6 (1.7)	53 (3.7)	44 (3.5)	14 (2.3)	50 (3.8)
	223 (2.3)	267 (3.6)!	224 (1.9)	263 (1.9)	220 (4.5)	277 (2.4)
Nation	46 (3.0)	7 (1.1)	44 (2.9)	50 (3.3)	10 (1.8)	42 (3.3)
	218 (1.9)	270 (3.7)	216 (1.7)	265 (1.5)	219 (2.6)	271 (2.1)
RACE/ ETHNICITY						
White						
State	32 (3.8)	6 (1.8)	54 (4.1)	43 (3.5)	14 (2.4)	51 (3.7)
	231 (2.2)	270 (3.5)!	230 (1.7)	269 (1.6)	228 (2.4)	282 (2.1)
Nation	44 (3.3)	6 (1.2)	45 (3.4)	51 (3.8)	11 (2.1)	43 (3.8)
	228 (1.9)	282 (4.5)	223 (1.6)	273 (1.5)	225 (2.4)!	282 (1.8)
Black						
State	32 (5.7)	4 (1.4)	50 (6.7)	50 (8.5)	18 (6.0)	47 (8.9)
	191 (4.0)	*** (**.*)	194 (2.5)	231 (4.2)!	189 (6.7)!	245 (7.2)!
Nation	50 (5.4)	7 (1.5)	44 (5.4)	50 (5.8)	6 (1.8)	42 (5.9)
	191 (2.1)	*** (**.*)	191 (2.5)	239 (2.5)	*** (**.*)	235 (2.4)
Hispanic						
State	42 (7.6)	7 (4.1)!	48 (7.1)	66 (7.0)!	10 (3.0)	27 (6.4)!
	202 (3.2)!	*** (**.*)	206 (3.8)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	48 (5.1)	11 (2.0)	41 (3.9)	49 (3.1)	11 (2.4)	40 (3.7)
	198 (2.8)	250 (5.2)	199 (2.5)	244 (1.9)	198 (6.1)!	247 (2.0)
TYPE OF COMMUNITY						
Adv. urban						
State	43 (13.5)!	0 (0.0)!	48 (10.7)!	23 (14.3)!	8 (6.8)!	77 (14.3)!
	235 (4.6)!	*** (**.*)	245 (9.3)!	*** (**.*)	*** (**.*)	*** (**.*)
Nation	52 (9.1)!	5 (3.5)!	40 (6.7)!	33 (9.5)!	8 (6.5)!	62 (8.8)!
	241 (6.1)!	*** (**.*)	240 (4.7)!	283 (9.5)!	*** (**.*)	285 (5.5)!
Disadv. urban						
State	37 (8.5)	0 (0.3)!	43 (8.0)	47 (9.5)!	21 (7.8)	52 (9.5)!
	189 (3.6)!	*** (**.*)	196 (4.3)!	242 (8.6)!	202 (15.3)!	248 (5.5)!
Nation	48 (8.6)	5 (2.3)	49 (8.2)	45 (9.1)	3 (1.9)	50 (9.4)
	189 (5.3)!	*** (**.*)	198 (3.2)!	241 (4.0)!	*** (**.*)	242 (4.2)!
Extreme rural						
State	31 (14.6)!	4 (2.7)!	40 (11.6)!	37 (8.3)!	30 (9.7)!	59 (9.0)!
	233 (8.6)!	*** (**.*)	226 (2.4)!	263 (6.0)!	232 (3.7)!	284 (4.7)!
Nation	37 (8.4)	8 (5.3)!	53 (7.7)	65 (8.8)!	10 (5.5)	27 (6.8)!
	223 (6.1)!	*** (**.*)	210 (6.5)!	267 (5.0)!	*** (**.*)	267 (11.7)!
Other						
State	29 (4.4)	6 (2.2)	61 (4.7)	48 (4.4)	10 (3.4)	46 (4.6)
	228 (2.6)	273 (4.2)!	226 (1.9)	270 (2.0)	222 (4.8)!	281 (2.4)
Nation	47 (3.3)	8 (1.3)	42 (3.2)	50 (3.7)	11 (2.1)	42 (3.8)
	218 (1.8)	272 (4.5)	217 (1.7)	265 (1.5)	220 (2.6)!	273 (2.0)

(continued on next page)

TABLE A21A (continued) | Teachers' Reports on the Use of Mathematical Objects

	At Least Weekly		Less Than Once a Week		Never or Hardly Ever	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	33 (3.5) 223 (2.3)	6 (1.7) 267 (3.6)!	53 (3.7) 224 (1.9)	44 (3.5) 263 (1.9)	14 (2.3) 220 (4.5)	50 (3.8) 277 (2.4)
Nation	46 (3.0) 218 (1.9)	7 (1.1) 270 (3.7)	44 (2.9) 216 (1.7)	50 (3.3) 265 (1.5)	10 (1.8) 219 (2.6)	42 (3.3) 271 (2.1)
PARENTS' EDUCATION						
College grad						
State	32 (3.4) 231 (3.0)	5 (1.7) *** (**.*)	53 (4.0) 232 (2.4)	38 (4.0) 272 (2.7)	15 (3.0) 222 (7.3)!	56 (4.3) 289 (2.4)
Nation	49 (3.5) 224 (2.5)	7 (1.2) 287 (5.7)	42 (3.5) 223 (2.5)	46 (3.2) 278 (2.2)	9 (2.1) 228 (3.8)!	47 (3.4) 282 (2.3)
Some college						
State	36 (4.4) 239 (3.6)	6 (2.4) *** (**.*)	52 (4.3) 234 (3.3)	46 (4.3) 267 (2.4)	11 (2.7) *** (**.*)	48 (4.3) 280 (2.8)
Nation	49 (3.6) 224 (3.3)	6 (1.1) 266 (5.5)	43 (3.1) 219 (2.9)	53 (4.3) 267 (1.8)	9 (2.5) *** (**.*)	41 (4.4) 276 (2.7)
HS graduate						
State	29 (4.3) 219 (3.6)	6 (1.8) *** (**.*)	55 (5.1) 220 (2.3)	47 (3.6) 259 (2.0)	15 (3.1) 219 (3.9)!	47 (3.9) 266 (3.0)
Nation	48 (3.8) 215 (3.1)	7 (1.4) 260 (4.2)	43 (3.6) 211 (2.9)	53 (3.7) 255 (1.9)	9 (1.7) *** (**.*)	40 (3.4) 259 (2.3)
HS non-grad						
State	31 (6.6) *** (**.*)	7 (2.3) *** (**.*)	54 (6.9) *** (**.*)	56 (5.5) 250 (3.4)	15 (3.4) *** (**.*)	37 (5.5) 254 (4.9)
Nation	37 (5.7) 202 (6.0)	10 (2.1) *** (**.*)	50 (5.9) 200 (3.3)	56 (5.2) 250 (2.7)	13 (4.6) *** (**.*)	34 (4.7) 250 (3.8)
Don't know						
State	35 (4.1) 213 (3.2)	5 (2.2) *** (**.*)	52 (4.0) 216 (2.2)	48 (5.4) 246 (5.7)	13 (2.4) 216 (3.9)	48 (5.8) *** (**.*)
Nation	43 (3.2) 211 (2.0)	9 (2.2) *** (**.*)	47 (3.1) 212 (1.7)	52 (4.7) 247 (2.8)	11 (2.0) 216 (3.8)!	39 (4.6) 257 (3.3)
GENDER						
Male						
State	32 (3.6) 223 (2.6)	6 (1.8) 272 (4.3)!	53 (3.9) 225 (2.3)	46 (3.7) 268 (2.1)	15 (2.4) 221 (5.1)	48 (4.1) 278 (2.6)
Nation	47 (3.2) 220 (2.0)	7 (1.1) 270 (4.4)	44 (3.2) 215 (1.8)	50 (3.5) 264 (1.6)	9 (1.7) 222 (2.9)!	43 (3.5) 271 (2.3)
Female						
State	34 (3.6) 222 (2.7)	6 (1.6) 262 (3.7)!	53 (3.9) 222 (2.0)	42 (3.5) 258 (2.3)	13 (2.4) 219 (4.5)	52 (3.6) 277 (2.6)
Nation	44 (2.9) 216 (2.2)	8 (1.3) 270 (4.3)	45 (2.9) 216 (1.9)	50 (3.1) 266 (1.8)	11 (2.1) 217 (3.2)!	42 (3.2) 271 (2.3)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). Comparisons to 1990 are not appropriate because of a change in the wording or format of the question. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A21B | Students' Reports on the Use of Mathematical Objects

	At Least Weekly		Less Than Once a Week		Never or Hardly Ever	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	34 (1.9) 220 (1.7)	16 (1.3) 265 (2.5)	29 (1.3) 230 (1.6)	24 (1.1) 273 (2.0)	36 (1.8) 222 (1.8)	60 (1.6) 271 (1.6)
Nation	35 (1.3) 215 (1.4)	20 (1.2) 263 (1.7)	24 (0.9) 226 (1.1)	27 (1.1) 272 (1.4)	41 (1.3) 214 (1.1)	52 (1.6) 265 (1.1)
RACE/ETHNICITY						
White						
State	32 (2.0) 228 (1.5)	16 (1.3) 270 (2.0)	31 (1.5) 236 (1.6)	24 (1.2) 277 (1.7)	37 (2.0) 228 (1.6)	59 (1.7) 277 (1.3)
Nation	32 (1.5) 226 (1.5)	20 (1.4) 274 (1.7)	26 (1.2) 232 (1.2)	29 (1.4) 280 (1.4)	41 (1.6) 223 (1.3)	51 (1.9) 275 (1.2)
Black						
State	46 (4.1) 193 (2.8)	15 (2.2) *** (**.*)	23 (2.3) 196 (4.1)	24 (3.2) 243 (5.6)!	31 (3.3) 190 (3.7)	61 (3.5) 237 (5.1)
Nation	41 (2.4) 190 (2.0)	22 (2.5) 232 (2.0)	15 (1.2) 194 (2.5)	24 (1.9) 243 (3.2)	44 (2.2) 190 (2.0)	55 (3.4) 235 (1.5)
Hispanic						
State	43 (4.9) 202 (4.1)	13 (3.9)! *** (**.*)	24 (4.1) *** (**.*)	24 (4.0)! *** (**.*)	33 (3.9) 203 (3.5)	63 (6.4)! *** (**.*)
Nation	42 (2.5) 200 (2.0)	21 (1.6) 241 (2.2)	18 (1.5) 203 (2.7)	25 (1.4) 254 (2.0)	40 (2.8) 197 (2.1)	54 (2.0) 243 (2.0)
TYPE OF COMMUNITY						
Adv urban						
State	30 (4.1)! 232 (5.4)!	26 (10.2)! *** (**.*)	35 (1.7)! 239 (5.4)!	17 (7.1)! *** (**.*)	35 (3.4)! 241 (3.8)!	57 (16.3)! *** (**.*)
Nation	36 (4.7)! 239 (3.5)!	16 (2.5)! *** (**.*)	28 (1.9)! 246 (5.4)!	31 (2.9)! 289 (5.9)!	36 (4.7)! 238 (3.9)!	53 (4.4)! 282 (3.3)!
Disadv urban						
State	42 (5.7) 193 (4.0)!	14 (2.6)! *** (**.*)	21 (2.5) 201 (5.8)!	27 (3.1)! 247 (4.5)!	37 (4.3) 197 (4.3)!	60 (3.8)! 246 (5.0)!
Nation	43 (2.7) 192 (3.5)	23 (3.0) 236 (4.3)!	14 (1.6) 195 (3.9)!	25 (2.0) 241 (2.9)!	43 (2.8) 194 (3.2)	52 (3.6) 239 (3.7)
Extreme rural						
State	37 (4.8)! 228 (2.1)!	16 (2.7)! *** (**.*)	30 (4.5)! 232 (3.1)!	27 (4.2)! 280 (5.1)!	33 (5.6)! 230 (2.9)!	57 (5.2)! 277 (3.9)!
Nation	28 (1.8) 216 (4.2)	27 (3.7)! 268 (4.0)!	26 (3.1) 225 (2.4)	29 (3.7)! 278 (3.0)!	46 (4.4) 209 (4.1)!	44 (4.9)! 259 (6.7)!
Other						
State	34 (2.4) 224 (2.2)	15 (1.5) 270 (2.6)	29 (1.8) 232 (1.8)	23 (1.5) 276 (1.8)	37 (2.9) 224 (1.9)	61 (1.9) 276 (1.7)
Nation	35 (1.6) 217 (1.9)	19 (1.5) 264 (1.8)	24 (1.1) 225 (1.2)	27 (1.2) 273 (1.3)	41 (1.4) 216 (1.1)	53 (1.8) 267 (1.3)

(continued on next page)

TABLE A21B (continued)

Students' Reports on the Use of Mathematical Objects

THE NATION'S REPORT CARD naep 1992 Trial State Assessment

	At Least Weekly		Less Than Once a Week		Never or Hardly Ever	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	34 (1.9)	16 (1.3)	29 (1.3)	24 (1.1)	36 (1.8)	60 (1.6)
	220 (1.7)	265 (2.5)	230 (1.6)	273 (2.0)	222 (1.8)	271 (1.6)
Nation	35 (1.3)	20 (1.2)	24 (0.9)	27 (1.1)	41 (1.3)	52 (1.6)
	215 (1.4)	263 (1.7)	226 (1.1)	272 (1.4)	214 (1.1)	265 (1.1)
PARENTS EDUCATION						
College grad						
State	33 (2.0)	16 (1.4)	34 (1.6)	26 (1.8)	33 (2.1)	59 (2.2)
	227 (2.4)	276 (2.9)	235 (2.7)	279 (2.9)	229 (2.5)	284 (1.9)
Nation	36 (1.7)	22 (1.4)	27 (1.2)	30 (1.1)	37 (1.7)	49 (1.5)
	221 (1.9)	275 (2.7)	232 (1.7)	282 (1.9)	223 (1.7)	279 (1.5)
Some college						
State	29 (3.4)	16 (1.7)	33 (3.9)	22 (1.8)	38 (3.7)	62 (2.0)
	233 (3.7)	266 (4.9)	243 (3.2)	275 (2.6)	233 (3.5)	275 (2.3)
Nation	32 (2.5)	19 (1.9)	23 (2.4)	30 (2.2)	45 (2.7)	51 (2.5)
	219 (3.5)	265 (2.8)	231 (3.5)	270 (2.2)	221 (2.6)	272 (1.7)
HS graduate						
State	34 (2.8)	18 (2.1)	31 (2.6)	25 (1.8)	35 (3.0)	57 (2.4)
	218 (2.8)	259 (3.0)	223 (2.6)	267 (2.4)	221 (2.1)	261 (2.1)
Nation	34 (2.4)	20 (1.5)	22 (1.8)	26 (1.8)	43 (2.2)	53 (2.5)
	209 (2.6)	251 (2.5)	223 (3.5)	264 (2.1)	209 (2.3)	254 (1.3)
HS non-grad						
State	42 (4.8)	14 (2.6)	20 (4.0)	18 (2.9)	39 (5.1)	68 (3.9)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	250 (3.3)
Nation	27 (3.1)	18 (2.0)	19 (2.5)	21 (3.2)	54 (3.7)	61 (3.3)
	196 (4.1)	251 (4.3)	*** (**.*)	255 (3.8)	203 (3.3)	246 (2.0)
Don't know						
State	37 (2.5)	19 (3.7)	24 (1.8)	21 (3.1)	39 (2.2)	60 (4.1)
	212 (2.5)	*** (**.*)	223 (2.5)	*** (**.*)	215 (2.2)	253 (4.2)
Nation	35 (1.5)	19 (2.4)	21 (1.3)	22 (2.0)	43 (1.6)	59 (2.6)
	212 (1.5)	248 (3.9)	218 (1.7)	260 (4.1)	209 (1.2)	249 (2.2)
GENDER						
Male						
State	34 (2.1)	18 (1.5)	29 (1.6)	26 (1.3)	36 (2.1)	57 (1.8)
	221 (1.9)	269 (3.0)	229 (2.1)	274 (2.4)	224 (2.2)	274 (1.9)
Nation	36 (1.6)	23 (1.6)	23 (0.9)	28 (1.2)	41 (1.5)	49 (1.9)
	215 (1.6)	262 (2.0)	227 (1.7)	272 (1.9)	217 (1.3)	265 (1.3)
Female						
State	35 (2.0)	15 (1.5)	29 (1.7)	22 (1.5)	36 (2.0)	63 (1.8)
	219 (2.2)	261 (2.9)	231 (1.9)	271 (2.5)	220 (2.1)	269 (1.8)
Nation	34 (1.3)	18 (1.2)	24 (1.2)	27 (1.3)	42 (1.6)	55 (1.8)
	215 (1.8)	265 (2.2)	225 (1.2)	272 (1.9)	212 (1.5)	265 (1.4)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). Comparisons to 1990 are not appropriate because of a change in the wording or format of the question. ! Interpret with caution — the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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1992 Trial State Assessment

TABLE A22A | Teachers' Reports on the Frequency of Mathematics Textbook Use

	Almost Every Day			At Least Once a Week			Less Than Weekly		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**			**Percentage of Students and Average Math Proficiency**		
TOTAL									
State	83 (2.5)	74 (2.9)	86 (2.0) >	15 (2.4)	24 (2.9)	12 (1.9) <	2 (0.8)	2 (0.5)	2 (0.7)
	225 (1.5)	272 (1.7)	273 (1.6)	215 (3.7)	254 (3.0)	258 (4.5)	191 (6.1)!	*** (**.*)	*** (**.*)
Nation	75 (2.4)	62 (3.4)	82 (1.6) >	21 (2.0)	34 (3.2)	15 (1.6) <	4 (1.4)	4 (1.3)	3 (0.7)
	216 (1.1)	267 (1.8)	271 (1.3)	219 (2.8)	255 (3.0)	256 (2.4)	227 (4.1)!	*** (**.*)	248 (6.0)!
RACE/ ETHNICITY									
White									
State	87 (2.5)	77 (3.1)	89 (2.1) >	12 (2.5)	21 (3.0)	9 (2.0) <	0 (0.2)	2 (0.9)	1 (0.5)
	231 (1.4)	275 (1.3)	277 (1.3)	227 (2.9)!	263 (2.1)	270 (4.0)!	*** (**.*)	*** (**.*)	*** (**.*)
Nation	73 (2.7)	64 (3.7)	84 (1.6) >	22 (2.4)	31 (3.4)	13 (1.6) <	5 (1.6)	4 (1.7)	3 (0.7)
	224 (1.2)	273 (2.0)	279 (1.4)	227 (2.7)	264 (3.2)	268 (2.0)	235 (3.7)!	*** (**.*)	261 (6.8)!
Black									
State	64 (8.1)	53 (8.7)	66 (5.2)	28 (6.2)	42 (10.6)	26 (4.9)	9 (5.4)	5 (4.7)	8 (3.9)
	196 (3.2)	246 (5.4)!	244 (5.7)	187 (4.7)!	230 (2.9)!	229 (4.9)!	*** (**.*)	*** (**.*)	*** (**.*)
Nation	80 (3.2)	56 (7.7)	74 (4.2)	17 (2.6)	42 (7.9)	20 (4.0)	3 (1.5)	2 (1.3)	6 (1.4)
	191 (1.8)	244 (4.1)	240 (1.7)	191 (4.0)	233 (5.5)!	232 (3.4)!	*** (**.*)	*** (**.*)	*** (**.*)
Hispanic									
State	78 (5.6)	57 (6.3)	80 (7.3)!	15 (4.3)	39 (6.5)	19 (7.2)!	7 (3.6)	4 (1.4)	1 (1.4)!
	205 (2.8)	*** (**.*)	248 (4.3)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	77 (4.2)	61 (6.8)	75 (3.5)	20 (3.5)	36 (5.6)	18 (2.9)	4 (1.5)	3 (1.7)	6 (1.7)
	199 (1.8)	250 (3.6)	249 (1.6)	196 (3.7)	241 (4.4)	235 (4.6)	*** (**.*)	*** (**.*)	*** (**.*)
TYPE OF COMMUNITY									
Adv. urban									
State	81 (11.0)!	68 (7.9)!	90 (6.7)!	19 (11.0)!	25 (6.7)!	10 (6.7)!	0 (0.0)!	6 (5.1)!	0 (0.0)!
	242 (6.4)!	294 (3.3)!	286 (7.3)!	*** (**.*)	272 (2.9)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	68 (12.8)!	63 (15.9)!	85 (6.3)!	32 (12.8)!	33 (12.0)!	11 (4.9)!	0 (0.0)!	4 (4.2)!	3 (2.4)!
	234 (3.8)!	284 (7.3)!	288 (5.4)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Disadv. urban									
State	63 (7.9)	62 (12.2)!	78 (6.2)!	27 (6.5)	38 (12.2)!	14 (5.7)!	11 (5.0)	0 (0.0)!	8 (3.5)!
	200 (4.9)!	256 (6.7)!	251 (5.3)!	187 (4.9)!	232 (8.5)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	69 (6.7)	66 (10.7)!	72 (7.1)	27 (6.2)	32 (11.4)!	23 (7.2)	4 (3.6)	2 (2.0)!	5 (2.8)
	192 (2.9)	253 (3.9)!	245 (3.0)!	200 (5.4)!	243 (9.3)!	230 (3.5)!	*** (**.*)	*** (**.*)	*** (**.*)
Extreme rural									
State	90 (4.7)!	68 (16.6)!	91 (5.7)!	10 (4.7)!	32 (16.3)!	9 (5.7)!	0 (0.0)!	1 (0.6)!	0 (0.0)!
	230 (1.6)!	273 (5.2)!	279 (4.4)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	84 (3.2)	50 (10.6)!	93 (4.9)! >	15 (3.2)	40 (10.0)!	6 (4.7)! <	1 (0.6)	10 (7.3)!	1 (1.0)!
	214 (5.0)!	269 (5.3)!	268 (4.7)!	220 (5.7)!	244 (9.4)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Other									
State	91 (2.7)	79 (3.6)	89 (2.4)	9 (2.7)	19 (3.6)	10 (2.1)	1 (0.4)	2 (0.8)	2 (0.8)
	227 (1.6)	271 (1.6)	276 (1.4)	222 (3.8)!	257 (3.8)!	269 (5.0)!	*** (**.*)	*** (**.*)	*** (**.*)
Nation	74 (3.4)	63 (3.9)	81 (2.0) >	20 (2.7)	34 (3.6)	16 (2.0) <	6 (1.9)	3 (1.4)	4 (0.9)
	217 (1.3)	267 (2.4)	272 (1.5)	217 (2.7)	255 (3.3)	259 (2.2)	233 (3.5)!	*** (**.*)	252 (7.3)!

(continued on next page)

THE NATION'S REPORT CARD naep 1992 Trial State Assessment

TABLE A22A (continued)

Teachers' Reports on the Frequency of Mathematics Textbook Use

	Almost Every Day			At Least Once a Week			Less Than Weekly		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	83 (2.5) 225 (1.5)	74 (2.9) 272 (1.7)	86 (2.0) > 273 (1.6)	15 (2.4) 215 (3.7)	24 (2.9) 254 (3.0)	12 (1.9) < 258 (4.5)	2 (0.8) 191 (6.1)!	2 (0.5) *** (**.*)	2 (0.7) *** (**.*)
Nation	75 (2.4) 216 (1.1)	62 (3.4) 267 (1.8)	82 (1.6) > 271 (1.3)	21 (2.0) 219 (2.8)	34 (3.2) 255 (3.0)	15 (1.6) < 256 (2.4)	4 (1.4) 227 (4.1)!	4 (1.3) *** (**.*)	3 (0.7) 248 (6.0)!
PARENTS EDUCATION									
College grad									
State	83 (2.8) 233 (2.1)	76 (3.4) 286 (2.3)	87 (2.3) 285 (1.4)	15 (2.5) 221 (4.7)	22 (3.2) 265 (3.3)	11 (2.2) 267 (5.0)!	2 (1.0) *** (**.*)	3 (1.2) *** (**.*)	2 (0.7) *** (**.*)
Nation	74 (2.9) 222 (1.4)	61 (4.0) 281 (2.3)	83 (1.8) > 284 (1.7)	21 (2.3) 227 (5.1)	36 (4.0) 265 (2.9)	13 (1.6) < 266 (3.1)	5 (1.6) 234 (5.1)!	3 (1.2) *** (**.*)	3 (0.8) 253 (7.4)!
Some college									
State	86 (3.0) 237 (2.4)	74 (3.9) 274 (1.6)	86 (2.6) 276 (1.8)	13 (2.8) *** (**.*)	25 (3.9) 261 (3.3)	12 (2.4) *** (**.*)	1 (0.9) *** (**.*)	1 (0.3) *** (**.*)	2 (0.9) *** (**.*)
Nation	77 (3.9) 222 (2.4)	68 (4.2) 273 (2.1)	83 (2.2) > 273 (1.5)	21 (3.5) *** (**.*)	29 (3.9) 259 (4.8)	15 (2.3) < 258 (4.1)	2 (1.7) *** (**.*)	2 (1.3) *** (**.*)	2 (0.9) *** (**.*)
HS graduate									
State	85 (3.0) 222 (1.7)	74 (3.4) 261 (1.9)	86 (2.3) > 263 (1.9)	13 (3.1) *** (**.*)	24 (3.5) 246 (4.0)	12 (2.1) 252 (5.3)	2 (1.2) *** (**.*)	2 (0.9) *** (**.*)	2 (0.8) *** (**.*)
Nation	76 (3.1) 212 (2.3)	61 (4.4) 257 (2.5)	80 (2.3) > 259 (1.5)	20 (3.0) 214 (4.3)	35 (3.9) 250 (3.0)	16 (2.3) < 252 (3.3)	4 (1.6) *** (**.*)	4 (1.9) *** (**.*)	4 (0.8) *** (**.*)
HS non-grad									
State	88 (3.5) 211 (3.7)	67 (5.5) 254 (2.7)	85 (3.6) 254 (2.9)	11 (3.5) *** (**.*)	31 (5.4) *** (**.*)	14 (3.5) *** (**.*)	1 (0.8) *** (**.*)	2 (2.5) *** (**.*)	1 (0.8) *** (**.*)
Nation	81 (3.8) 200 (3.1)	67 (5.5) 244 (3.2)	79 (2.6) 252 (2.0)	18 (3.9) *** (**.*)	29 (5.2) *** (**.*)	16 (2.5) 243 (6.5)	1 (0.6) *** (**.*)	4 (2.0) *** (**.*)	5 (1.7) *** (**.*)
Don't know									
State	82 (3.1) 217 (2.0)	71 (5.0) 250 (5.2)	83 (3.6) 257 (3.6)	16 (3.0) 207 (4.7)!	25 (4.9) *** (**.*)	12 (3.2) *** (**.*)	2 (0.9) *** (**.*)	3 (1.1) *** (**.*)	5 (2.8) *** (**.*)
Nation	73 (2.8) 211 (1.3)	58 (5.8) 244 (4.0)	79 (2.6) > 256 (2.1)	22 (2.4) 214 (2.7)	38 (5.5) 233 (4.8)	17 (2.4) < 239 (4.2)	5 (1.6) *** (**.*)	5 (2.6) *** (**.*)	4 (1.1) *** (**.*)
GENDER									
Male									
State	83 (2.7) 226 (1.8)	73 (3.0) 274 (2.0)	86 (2.3) > 276 (1.7)	15 (2.7) 217 (3.7)	24 (2.9) 257 (3.0)	13 (2.2) < 262 (4.8)	2 (0.7) *** (**.*)	3 (0.5) *** (**.*)	2 (0.7) *** (**.*)
Nation	73 (2.4) 216 (1.1)	60 (3.7) 268 (2.3)	80 (1.8) > 271 (1.4)	22 (2.1) 220 (3.1)	36 (3.5) 256 (3.5)	16 (1.7) < 256 (2.5)	5 (1.5) 230 (4.9)!	4 (1.6) *** (**.*)	4 (0.8) 245 (6.5)!
Female									
State	84 (2.5) 224 (1.7)	75 (3.2) 269 (1.9)	87 (2.0) > 271 (1.8)	14 (2.2) 212 (4.7)	23 (3.2) 250 (3.4)	11 (1.8) < 252 (5.1)	2 (1.0) *** (**.*)	2 (0.6) *** (**.*)	2 (0.8) *** (**.*)
Nation	77 (2.5) 215 (1.5)	65 (3.6) 266 (1.9)	83 (1.6) > 271 (1.5)	20 (2.1) 218 (3.2)	32 (3.4) 254 (3.4)	14 (1.6) < 257 (3.1)	4 (1.3) 224 (5.2)!	3 (1.4) *** (**.*)	3 (0.6) 252 (6.6)!

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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THE NATION'S REPORT CARD naep
1992 Trial State Assessment

TABLE A22B | Students' Reports on the Frequency of Mathematics Textbook Use

	Almost Every Day			At Least Once a Week			Less Than Weekly		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	71 (1.4)	75 (1.7)	85 (1.6) >	17 (1.2)	22 (1.5)	10 (1.1) <	12 (1.2)	4 (0.5)	5 (1.0)
	227 (1.5)	270 (1.5)	274 (1.4)	219 (2.5)	256 (2.4)	255 (3.0)	209 (2.5)	259 (6.6)	250 (4.8)
Nation	65 (1.4)	74 (1.9)	84 (1.0) >	17 (1.0)	20 (1.2)	11 (0.8) <	18 (1.0)	6 (1.0)	5 (0.4)
	219 (0.9)	267 (1.3)	270 (1.1)	220 (1.7)	249 (1.8)	251 (1.9)	208 (1.8)	241 (6.0)	245 (2.6)
RACE/ ETHNICITY									
White									
State	73 (1.4)	77 (1.9)	87 (1.6) >	16 (1.4)	20 (1.6)	9 (1.0) <	11 (1.2)	3 (0.6)	4 (1.0)
	233 (1.3)	275 (1.1)	278 (1.1)	227 (2.3)	264 (2.1)	263 (2.9)	219 (2.1)	271 (5.5)!	259 (5.0)!
Nation	66 (1.6)	76 (2.5)	87 (0.9) >	18 (1.2)	18 (1.4)	9 (0.8) <	16 (1.1)	6 (1.3)	4 (0.4)
	227 (1.1)	274 (1.4)	278 (1.2)	230 (1.7)	258 (2.1)	265 (2.4)	218 (2.0)	250 (7.8)!	256 (3.2)
Black									
State	64 (3.6)	64 (6.8)	74 (4.8)	21 (3.0)	29 (5.7)	16 (3.2)	15 (2.9)	6 (2.7)	10 (2.4)
	196 (2.7)	244 (4.3)	240 (5.7)	188 (3.4)	233 (2.8)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	66 (2.2)	71 (2.8)	78 (2.3)	15 (1.2)	23 (1.9)	16 (1.6) <	20 (2.1)	5 (1.9)	6 (1.0)
	193 (1.5)	241 (2.9)	239 (1.5)	189 (2.4)	231 (3.9)	227 (2.0)	182 (3.0)	*** (**.*)	230 (4.0)
Hispanic									
State	61 (5.5)	60 (4.8)	75 (4.6)!	19 (3.8)	32 (4.7)	16 (3.8)!	21 (3.4)	8 (2.4)	9 (3.0)!
	209 (2.8)	228 (4.9)	249 (4.4)! >	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	58 (2.1)	61 (3.7)	73 (2.6)	19 (1.4)	29 (3.4)	17 (2.0) <	23 (1.4)	9 (1.5)	10 (1.4)
	204 (1.5)	249 (2.6)	250 (1.3)	195 (2.8)	237 (5.0)	233 (3.3)	193 (2.6)	*** (**.*)	227 (5.0)
TYPE OF COMMUNITY									
Adv urban									
State	75 (3.9)!	71 (5.8)!	93 (5.0)!	13 (2.4)!	24 (3.8)!	7 (5.0)!	11 (2.8)!	5 (2.6)!	0 (0.0)!
	240 (5.0)!	293 (2.3)	291 (6.9)!	*** (**.*)	277 (4.0)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	63 (4.5)!	73 (11.1)!	86 (3.6)!	25 (4.4)!	22 (7.1)!	9 (2.5)!	12 (3.4)!	5 (4.1)!	5 (1.6)!
	239 (3.5)!	287 (5.1)!	288 (4.4)!	246 (5.2)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Disadv urban									
State	66 (5.3)	69 (5.5)!	76 (4.3)!	20 (3.3)	27 (5.1)!	15 (3.1)!	15 (3.5)	4 (1.5)!	8 (2.4)!
	202 (4.3)!	251 (6.1)!	246 (5.9)!	186 (4.3)!	232 (4.1)!	*** (**.*)	180 (4.7)!	*** (**.*)	*** (**.*)
Nation	64 (2.8)	69 (2.8)!	77 (3.0)	18 (1.8)	23 (2.7)!	17 (2.3)	19 (2.1)	8 (1.6)!	6 (1.1)
	195 (2.9)	254 (4.2)!	242 (3.1)	192 (4.0)!	241 (5.0)!	228 (3.5)!	186 (4.0)	*** (**.*)	*** (**.*)
Extreme rural									
State	72 (3.1)!	65 (2.4)!	90 (2.8)!	19 (2.6)!	14 (2.2)!	8 (2.5)!	9 (1.5)!	1 (0.6)!	2 (0.6)!
	232 (1.8)!	269 (3.3)!	278 (4.1)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	69 (2.9)	68 (11.3)!	89 (3.4)!	15 (2.2)	22 (7.1)!	7 (2.9)!	17 (1.5)	10 (4.7)!	3 (0.9)!
	221 (3.5)	263 (4.3)!	268 (4.7)!	206 (6.8)!	*** (**.*)	*** (**.*)	205 (4.5)!	*** (**.*)	*** (**.*)
Other									
State	72 (2.0)	77 (2.1)	86 (2.0) >	17 (2.1)	20 (1.9)	9 (1.3) <	11 (1.7)	3 (0.7)	5 (1.3)
	229 (1.6)	270 (1.7)	277 (1.3) >	222 (2.7)	259 (2.2)	263 (3.0)	214 (3.3)	*** (**.*)	258 (6.1)!
Nation	65 (1.9)	75 (2.2)	84 (1.1) >	17 (1.3)	19 (1.4)	11 (0.8) <	18 (1.3)	6 (1.2)	5 (0.5)
	220 (1.1)	267 (1.6)	271 (1.3)	222 (1.8)	249 (2.5)	253 (2.2)	210 (2.1)	238 (4.9)!	246 (2.8)

(continued on next page)

THE NATION'S REPORT CARD naep
1992 Trial State Assessment

TABLE A22B (continued)

Students' Reports on the Frequency of Mathematics Textbook Use

	Almost Every Day			At Least Once a Week			Less Than Weekly		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	71 (1.4)	75 (1.7)	85 (1.6) >	17 (1.2)	22 (1.5)	10 (1.1) <	12 (1.2)	4 (0.5)	5 (1.0)
	227 (1.5)	270 (1.5)	274 (1.4)	219 (2.5)	256 (2.4)	255 (3.0)	209 (2.5)	259 (6.6)	250 (4.8)
Nation	65 (1.4)	74 (1.9)	84 (1.0) >	17 (1.0)	20 (1.2)	11 (0.8) <	18 (1.0)	6 (1.0)	5 (0.4)
	219 (0.9)	267 (1.3)	270 (1.1)	220 (1.7)	249 (1.8)	251 (1.9)	208 (1.8)	241 (6.0)	245 (2.6)
PARENTS EDUCATION									
College grad									
State	74 (1.8)	78 (2.1)	86 (1.9) >	16 (1.6)	19 (1.9)	9 (1.4) <	10 (1.4)	3 (0.6)	5 (1.1)
	233 (2.1)	284 (2.0)	285 (1.6)	224 (3.7)	269 (3.9)	264 (5.1)	214 (4.3)	*** (**.*)	*** (**.*)
Nation	67 (1.6)	77 (2.7)	86 (1.1)	17 (1.2)	18 (1.9)	10 (1.0) <	15 (1.2)	5 (1.3)	4 (0.5)
	226 (1.2)	279 (1.6)	282 (1.6)	231 (2.8)	258 (2.9)	260 (2.8)	212 (3.2)	*** (**.*)	253 (5.2)
Some college									
State	73 (2.5)	74 (2.4)	86 (2.3) >	17 (2.5)	23 (2.4)	10 (1.5) <	9 (1.9)	3 (0.7)	5 (1.5)
	239 (2.2)	274 (1.7)	276 (1.7)	*** (**.*)	262 (3.9)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	66 (3.0)	80 (2.0)	87 (1.3) >	20 (2.2)	16 (1.4)	9 (1.1) <	14 (2.4)	4 (1.0)	4 (0.6)
	224 (2.2)	270 (1.8)	272 (1.2)	223 (4.0)	255 (4.2)	255 (4.2)	*** (**.*)	*** (**.*)	*** (**.*)
HS graduate									
State	71 (2.6)	75 (2.2)	85 (1.7) >	19 (2.4)	20 (1.9)	10 (1.1) <	10 (1.6)	4 (0.9)	5 (1.0)
	222 (1.7)	259 (1.7)	264 (1.6)	219 (4.2)	249 (2.4)	250 (3.9)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	68 (2.8)	71 (3.6)	82 (1.3)	14 (1.9)	22 (2.5)	12 (1.2) <	17 (2.2)	7 (1.6)	6 (0.8)
	214 (1.9)	258 (1.8)	259 (1.4)	213 (5.1)	247 (2.5)	245 (3.9)	206 (3.4)	*** (**.*)	239 (4.4)
HS non-grad									
State	52 (4.7)	62 (5.4)	78 (4.3)	28 (4.1)	33 (4.8)	15 (3.8) <	20 (4.1)	5 (2.3)	8 (2.2)
	*** (**.*)	253 (3.5)	255 (2.9)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	63 (3.0)	64 (3.4)	77 (1.7) >	13 (2.2)	27 (2.7)	15 (1.5) <	24 (2.9)	9 (1.9)	8 (1.1)
	205 (3.2)	244 (2.7)	252 (1.8)	*** (**.*)	241 (3.9)	240 (3.5)	200 (5.5)	*** (**.*)	*** (**.*)
Don't know									
State	70 (2.1)	67 (4.3)	77 (4.2)	16 (1.6)	28 (4.5)	14 (3.1)	15 (1.7)	5 (2.1)	9 (2.9)
	219 (1.9)	245 (4.8)	256 (3.9)	213 (3.8)	*** (**.*)	*** (**.*)	202 (3.5)	*** (**.*)	*** (**.*)
Nation	62 (1.9)	64 (3.3)	80 (2.2) >	18 (1.3)	26 (3.0)	13 (1.8) <	20 (1.4)	11 (1.7)	7 (1.2)
	214 (1.1)	247 (3.0)	254 (2.1)	212 (1.9)	233 (4.7)	240 (3.6)	205 (1.7)	*** (**.*)	*** (**.*)
GENDER									
Male									
State	69 (1.5)	74 (1.8)	85 (1.8) >	18 (1.3)	22 (1.6)	10 (1.2) <	13 (1.4)	4 (0.6)	5 (1.1)
	228 (1.8)	273 (1.7)	276 (1.4)	221 (2.8)	260 (2.8)	261 (4.0)	208 (3.0)	*** (**.*)	251 (5.7)!
Nation	65 (1.5)	72 (2.4)	84 (1.1) >	18 (1.0)	21 (1.7)	11 (0.9) <	18 (1.1)	7 (1.1)	5 (0.6)
	220 (1.0)	269 (1.6)	270 (1.2)	221 (2.0)	250 (2.2)	250 (2.4)	211 (1.9)	239 (7.0)	240 (3.5)
Female									
State	73 (1.7)	75 (1.9)	84 (1.7) >	16 (1.3)	21 (1.6)	11 (1.3) <	11 (1.3)	3 (0.5)	5 (1.1)
	226 (1.7)	267 (1.9)	272 (1.8)	216 (2.8)	253 (2.9)	250 (3.9)	212 (3.6)	*** (**.*)	249 (5.6)
Nation	66 (1.5)	76 (1.8)	84 (1.1) >	17 (1.2)	19 (1.3)	11 (0.9) <	18 (1.3)	6 (1.2)	5 (0.5)
	219 (1.2)	265 (1.5)	270 (1.3)	219 (2.4)	249 (2.7)	252 (2.7)	205 (2.2)	244 (6.4)!	250 (3.6)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A23A | Teachers' Reports on the Frequency of Mathematics Worksheet Use

	Almost Every Day			At Least Once a Week			Less Than Weekly		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	52 (3.9) 225 (1.8)	12 (2.1) 259 (5.3)	10 (2.1) 253 (4.8)!	39 (3.4) 221 (2.4)	64 (3.2) 267 (2.1)	58 (2.9) 271 (1.6)	9 (1.7) 220 (5.4)!	25 (3.3) 272 (3.6)	32 (2.9) 277 (2.9)
Nation	26 (2.3) 218 (2.0)	5 (1.7) 264 (5.3)!	12 (1.9) > 259 (4.9)	58 (2.4) 217 (1.6)	63 (3.5) 257 (1.8)	54 (2.2) 266 (1.6) >	16 (2.0) 215 (2.1)	32 (3.6) 274 (2.7)	35 (2.7) 273 (1.9)
RACE/ ETHNICITY									
White									
State	57 (4.3) 230 (1.7)	11 (2.4) 269 (2.8)!	8 (1.9) 261 (4.5)!	35 (3.9) 230 (2.1)	65 (3.0) 272 (1.5)	59 (3.0) 275 (1.2)	8 (1.8) 233 (4.5)!	24 (3.1) 276 (3.0)	32 (3.0) 282 (2.7)
Nation	25 (2.7) 228 (1.9)	6 (2.2) 269 (5.6)!	11 (2.4) 267 (4.9)!	58 (2.9) 225 (1.6)	60 (3.6) 264 (2.2)	54 (2.5) 275 (1.6) >	16 (2.3) 223 (2.4)	35 (3.8) 279 (2.8)	35 (3.3) 283 (2.1)
Black									
State	27 (4.3) 193 (3.7)	12 (5.8) *** (**.*)	24 (8.5) 229 (5.6)!	57 (4.6) 193 (3.7)	62 (10.8) 235 (3.9)!	46 (6.2) 240 (4.6)	16 (4.1) *** (**.*)	25 (9.7) *** (**.*)	30 (7.0) 240 (10.5)!
Nation	28 (4.2) 189 (2.4)	2 (1.1) *** (**.*)	14 (3.2) > 238 (7.3)!	53 (4.3) 192 (2.0)	74 (6.2) 238 (3.1)	55 (5.3) 236 (2.0)	19 (3.3) 191 (3.5)	23 (6.3) 246 (7.7)!	31 (4.7) 239 (2.5)
Hispanic									
State	46 (7.0) 203 (4.2)	25 (8.5) *** (**.*)	13 (5.1)! *** (**.*)	44 (7.1) 206 (4.1)	57 (8.4) *** (**.*)	69 (6.8)! *** (**.*)	9 (3.4) *** (**.*)	18 (4.4) *** (**.*)	19 (5.0)! *** (**.*)
Nation	27 (3.3) 202 (3.6)	6 (1.9) *** (**.*)	11 (2.1) 239 (6.4)	60 (3.5) 197 (2.2)	61 (7.9) 240 (3.3)	52 (2.9) 247 (2.4)	13 (2.3) 198 (3.9)	33 (7.5) 258 (2.9)!	36 (3.0) 246 (2.5) <
TYPE OF COMMUNITY									
Adv. urban									
State	64 (13.1)! 242 (5.7)!	21 (8.7)! *** (**.*)	0 (0.0)! *** (**.*)	29 (9.8)! 236 (9.7)!	59 (8.6)! 288 (3.8)!	67 (18.7)! *** (**.*)	7 (5.6)! *** (**.*)	19 (5.6)! *** (**.*)	33 (18.7)! *** (**.*)
Nation	30 (10.3)! 230 (2.8)!	6 (3.8)! *** (**.*)	24 (9.1)! *** (**.*)	66 (10.0)! 245 (3.8)!	74 (7.1)! 274 (2.8)!	41 (6.8)! < 283 (4.6)!	4 (1.8)! *** (**.*)	21 (8.2)! *** (**.*)	35 (6.2)! 285 (6.8)!
Disadv. urban									
State	30 (7.6) 196 (8.3)!	6 (4.8)! *** (**.*)	14 (5.2)! *** (**.*)	57 (6.1) 196 (3.8)	72 (8.9)! 243 (8.2)!	61 (6.8)! 251 (7.0)!	14 (5.3) *** (**.*)	21 (6.2)! *** (**.*)	24 (5.7)! 238 (8.5)!
Nation	24 (6.5) 204 (4.3)!	3 (3.1)! *** (**.*)	10 (4.9) *** (**.*)	59 (6.5) 192 (4.2)!	69 (10.8)! 246 (7.0)!	49 (7.5) 237 (4.1)!	17 (5.7) 188 (3.9)!	28 (10.7)! 259 (4.5)!	42 (8.5) 246 (5.5)!
Extreme rural									
State	66 (11.2)! 230 (1.9)!	1 (0.6)! *** (**.*)	8 (5.0)! *** (**.*)	22 (8.0)! 228 (4.8)!	53 (9.2)! 270 (5.9)!	50 (7.4)! 274 (3.4)!	12 (8.1)! *** (**.*)	46 (9.4)! 267 (7.6)!	41 (8.1)! 286 (7.4)!
Nation	20 (6.1) 201 (7.7)!	0 (0.0)! *** (**.*)	14 (7.3)! 250 (10.1)!	54 (7.0) 218 (4.1)!	76 (10.1)! 253 (5.3)!	44 (11.4)! 264 (8.6)!	26 (6.0) 218 (6.6)!	24 (10.1)! *** (**.*)	42 (12.5)! 274 (5.1)!
Other									
State	55 (4.8) 224 (1.9)	12 (2.8) 263 (4.8)!	7 (2.1) 265 (4.7)!	38 (4.5) 228 (2.5)	62 (4.5) 269 (1.5)	62 (3.7) 273 (1.4)	7 (2.1) 232 (7.1)!	26 (4.6) 270 (4.7)!	30 (3.8) 282 (2.9)
Nation	27 (2.7) 221 (2.4)	6 (2.3) 265 (6.3)!	10 (1.6) 257 (3.0)	57 (3.0) 217 (1.3)	58 (4.0) 257 (2.3)	57 (2.7) 267 (1.8) >	15 (2.2) 217 (2.5)	36 (4.2) 272 (2.9)	33 (2.9) 276 (2.0)

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THE NATION'S REPORT CARD NAEP 1992 Trial State Assessment

TABLE A23A (continued) | Teachers' Reports on the Frequency of Mathematics Worksheet Use

	Almost Every Day			At Least Once a Week			Less Than Weekly		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**			**Percentage of Students and Average Math Proficiency**		
TOTAL									
State	52 (3.9)	12 (2.1)	10 (2.1)	39 (3.4)	64 (3.2)	58 (2.9)	9 (1.7)	25 (3.3)	32 (2.9)
	225 (1.8)	259 (5.3)	253 (4.8)!	221 (2.4)	267 (2.1)	271 (1.6)	220 (5.4)!	272 (3.6)	277 (2.9)
Nation	26 (2.3)	5 (1.7)	12 (1.9) >	58 (2.4)	63 (3.5)	54 (2.2)	16 (2.0)	32 (3.6)	35 (2.7)
	218 (2.0)	264 (5.3)!	259 (4.9)	217 (1.6)	257 (1.8)	266 (1.6) >	215 (2.1)	274 (2.7)	273 (1.9)
PARENTS' EDUCATION									
College grad State	52 (4.5)	10 (2.0)	8 (2.1)	39 (3.7)	66 (3.7)	56 (3.1)	9 (2.0)	23 (3.5)	35 (3.1)
	234 (2.2)	272 (6.7)	265 (7.4)!	224 (3.5)	281 (2.3)	280 (1.9)	231 (8.9)!	288 (4.5)	289 (2.4)
Nation	27 (2.7)	6 (1.8)	12 (2.5)	58 (2.6)	62 (3.1)	52 (2.5)	16 (1.9)	33 (3.5)	36 (2.9)
	224 (2.6)	*** (**.*)	272 (7.6)!	225 (2.2)	268 (2.1)	[illegible] (2.0) >	220 (3.0)	289 (3.0)	288 (2.2)
Some college State	54 (4.6)	12 (3.1)	10 (2.3)	36 (4.2)	62 (3.9)	[illegible] (3.9)	10 (3.4)	26 (3.8)	30 (3.7)
	237 (2.6)	*** (**.*)	*** (**.*)	237 (3.6)	271 (2.2)	275 (2.0)	*** (**.*)	274 (3.6)	278 (3.8)
Nation	23 (3.2)	4 (1.7)	9 (1.9)	56 (4.2)	61 (4.3)	55 (3.0)	21 (3.7)	35 (4.1)	36 (2.9)
	224 (3.9)	*** (**.*)	253 (4.5)!	222 (2.8)	264 (2.6)	270 (2.0)	*** (**.*)	278 (3.1)	275 (2.3)
HS graduate State	51 (4.7)	12 (2.7)	12 (2.5)	42 (4.6)	63 (3.4)	58 (3.3)	8 (1.9)	26 (3.7)	30 (3.3)
	220 (2.1)	251 (4.4)!	245 (4.7)!	219 (2.8)	256 (2.4)	263 (1.9)	*** (**.*)	262 (4.1)	268 (4.2)
Nation	31 (3.7)	5 (2.2)	11 (2.0)	52 (3.3)	65 (4.6)	56 (2.6)	17 (2.6)	30 (4.8)	33 (3.0)
	215 (3.7)	*** (**.*)	252 (3.5)	211 (2.8)	250 (1.9)	256 (1.7)	214 (4.4)	263 (3.7)	260 (2.7)
HS non-grad. State	60 (6.6)	13 (4.6)	11 (3.2)	35 (6.4)	64 (7.4)	68 (5.3)	6 (2.4)	23 (6.8)	21 (5.0)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	248 (6.1)	255 (3.6)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	17 (3.5)	3 (2.0)	17 (4.7)	64 (3.9)	61 (7.0)	48 (4.3)	18 (3.8)	36 (6.9)	36 (6.3)
	*** (**.*)	*** (**.*)	245 (8.2)!	204 (4.0)	240 (2.8)	248 (2.6)	*** (**.*)	249 (6.0)!	255 (3.0)
Don't know State	52 (4.4)	15 (4.4)	17 (4.2)	39 (4.1)	60 (6.8)	51 (4.9)	9 (2.0)	25 (5.9)	33 (4.1)
	217 (2.5)	*** (**.*)	*** (**.*)	214 (2.7)	*** (**.*)	253 (4.6)	207 (4.8)!	*** (**.*)	*** (**.*)
Nation	25 (2.4)	6 (2.8)	12 (2.2)	59 (2.7)	65 (5.6)	58 (3.4)	15 (2.3)	29 (5.3)	30 (3.4)
	214 (2.3)	*** (**.*)	250 (6.3)	212 (1.7)	238 (3.8)	254 (2.2) >	211 (2.5)	*** (**.*)	248 (3.1)
GENDER									
Male State	52 (3.9)	13 (2.4)	10 (2.2)	39 (3.4)	61 (3.0)	59 (2.9)	9 (2.0)	25 (3.2)	31 (2.8)
	226 (2.1)	259 (4.6)	257 (5.1)!	223 (2.6)	270 (2.3)	274 (1.5)	217 (6.2)!	276 (3.3)	278 (3.3)
Nation	26 (2.5)	6 (1.9)	12 (1.9)	57 (2.8)	64 (3.2)	53 (2.3) <	17 (2.2)	31 (3.5)	35 (2.7)
	218 (2.2)	*** (**.*)	258 (4.1)	219 (1.9)	258 (2.3)	265 (1.9)	214 (2.2)	275 (3.0)	274 (2.1)
Female State	52 (4.2)	10 (1.9)	10 (2.2)	39 (3.7)	66 (3.6)	57 (3.1)	8 (1.6)	24 (3.5)	32 (3.3)
	224 (2.2)	260 (6.6)	249 (5.2)!	218 (2.8)	264 (2.3)	267 (2.1)	223 (5.3)!	269 (4.5)	276 (3.2)
Nation	26 (2.3)	4 (1.9)	11 (2.1) >	58 (2.2)	61 (4.1)	54 (2.4)	15 (1.9)	34 (4.1)	35 (2.8)
	218 (2.5)	*** (**.*)	261 (6.4)	215 (1.7)	256 (1.9)	267 (1.8) >	216 (2.9)	273 (2.9)	273 (2.3)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A23B | Students' Reports on the Frequency of Mathematics Worksheet Use

	Almost Every Day			At Least Once a Week			Less Than Weekly		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	52 (2.2)	18 (1.7)	24 (2.0) >	34 (1.4)	47 (2.0)	42 (1.8)	15 (1.5)	35 (2.4)	34 (2.2)
	223 (1.7)	257 (3.0)	260 (2.6)	224 (1.7)	267 (2.0)	271 (1.7)	222 (2.9)	271 (2.3)	278 (2.1)
Nation	45 (1.4)	17 (1.7)	22 (1.4)	37 (0.9)	46 (1.8)	42 (1.2)	18 (1.0)	37 (2.5)	36 (1.7)
	218 (1.2)	247 (2.9)	256 (2.5)	219 (1.1)	260 (1.4)	266 (1.4) >	215 (1.5)	272 (1.8)	273 (1.3)
RACE/ ETHNICITY									
White									
State	52 (2.5)	16 (1.8)	22 (2.1)	34 (1.5)	48 (2.1)	43 (1.9)	14 (1.8)	35 (2.4)	36 (2.2)
	230 (1.5)	265 (2.0)	268 (2.2)	230 (1.6)	272 (1.5)	275 (1.6)	231 (2.8)	276 (1.8)	282 (1.7)
Nation	45 (1.9)	16 (2.2)	19 (1.7)	37 (1.2)	43 (2.2)	43 (1.5)	18 (1.3)	41 (3.0)	39 (2.1)
	227 (1.2)	255 (3.7)	267 (2.7)	226 (1.5)	268 (1.5)	275 (1.7) >	225 (1.6)	277 (1.9)	282 (1.5)
Black									
State	51 (4.4)	23 (5.3)	41 (5.6)	30 (3.6)	38 (7.1)	34 (3.9)	20 (2.4)	38 ([illegible])	26 (7.2)
	189 (3.2)	*** (**.*)	229 (3.3)	198 (2.8)	239 (3.1)!	243 (4.3)	193 (3.5)	249 (5.1)!	244 (11.7)!
Nation	44 (2.1)	23 (2.7)	30 (2.5)	35 (1.7)	56 (2.4)	43 (2.0) <	21 (1.5)	20 (3.1)	27 (2.1)
	190 (1.9)	232 (5.8)	234 (2.6)	192 (2.0)	239 (3.0)	237 (1.8)	189 (2.6)	240 (4.3)	238 (1.9)
Hispanic									
State	47 (4.1)	26 (4.7)	30 (4.1)!	35 (4.3)	49 (7.3)	48 (4.4)!	18 (2.9)	25 (5.4)	22 (4.2)!
	204 (3.9)	*** (**.*)	*** (**.*)	203 (3.3)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	47 (2.4)	19 (2.7)	29 (2.5) >	33 (2.1)	50 (3.8)	40 (2.0)	21 (1.6)	32 (4.3)	31 (2.6)
	197 (1.8)	232 (4.3)	239 (2.7)	203 (2.0)	244 (3.2)	248 (1.7)	199 (3.1)	246 (3.8)	246 (2.5)
TYPE OF COMMUNITY									
Adv. urban									
State	52 (7.9)!	27 (7.7)!	22 (13.7)!	35 (3.0)!	42 (6.0)!	46 (9.3)!	13 (6.1)!	30 (4.7)!	32 (19.5)!
	236 (4.5)!	275 (2.1)!	*** (**.*)	238 (5.5)!	292 (3.3)!	*** (**.*)	*** (**.*)	295 (4.5)!	*** (**.*)
Nation	49 (5.4)!	24 (6.2)!	25 (5.9)!	36 (3.9)!	44 (5.1)!	38 (3.9)!	15 (3.5)!	31 (9.3)!	37 (4.3)!
	243 (2.9)!	*** (**.*)	284 (8.9)!	238 (4.9)!	277 (4.4)!	278 (5.6)!	238 (4.7)!	299 (5.3)!	293 (5.1)!
Disadv. urban									
State	49 (5.2)	21 (6.1)!	30 (5.0)!	32 (4.1)	44 (7.4)!	[illegible] (4.4)!	20 (3.1)	35 (7.0)!	23 (4.3)!
	192 (5.1)!	*** (**.*)	232 (4.5)!	201 (5.1)!	246 (5.1)!	253 (5.3)!	198 (5.1)!	257 (5.8)!	246 (8.2)!
Nation	42 (2.5)	17 (3.4)!	28 (3.8)	35 (2.0)	42 (5.6)!	41 (2.9)	22 (2.2)	41 (6.7)!	31 (2.9)
	195 (3.6)	235 (6.2)!	228 (4.1)!	195 (3.5)	251 (5.9)!	241 (3.6)	187 (3.0)	254 (4.2)!	245 (3.3)
Extreme rural									
State	54 (6.0)!	10 (3.6)!	13 (3.8)!	30 (2.8)!	50 (5.1)!	43 (4.7)!	15 (5.4)!	39 (7.1)!	44 (5.9)!
	229 (2.4)!	*** (**.*)	*** (**.*)	229 (3.6)!	269 (5.2)!	278 (5.6)!	*** (**.*)	269 (8.3)!	281 (5.0)!
Nation	42 (3.7)	20 (8.0)!	18 (3.3)!	37 (1.9)	52 (3.8)!	41 (4.2)!	21 (2.5)	28 (7.5)!	41 (5.8)!
	211 (4.6)!	*** (**.*)	256 (7.1)!	219 (3.7)	257 (3.8)!	266 (5.8)!	221 (4.2)	266 (7.8)!	272 (4.8)!
Other									
State	52 (2.8)	16 (1.6)	23 (2.7)	35 (2.0)	48 (2.7)	41 (2.2)	14 (1.8)	36 (3.2)	36 (2.9)
	226 (1.8)	260 (2.6)	268 (2.0)	227 (1.9)	266 (1.7)	273 (1.8)	226 (3.7)	272 (2.6)	282 (2.4)
Nation	46 (1.6)	16 (2.0)	21 (1.5)	37 (1.2)	46 (2.1)	43 (1.5)	18 (1.1)	38 (2.9)	36 (1.8)
	218 (1.3)	246 (3.5)	256 (2.0)	220 (1.2)	259 (2.0)	268 (1.8) >	217 (2.1)	272 (1.8)	274 (1.5)

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TABLE A23B (continued)

Students' Reports on the Frequency of Mathematics Worksheet Use

	Almost Every Day			At Least Once a Week			Less Than Weekly		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	52 (2.2)	18 (1.7)	24 (2.0) >	34 (1.4)	47 (2.0)	42 (1.6)	15 (1.5)	35 (2.4)	34 (2.2)
	223 (1.7)	257 (3.0)	260 (2.6)	224 (1.7)	267 (2.0)	271 (1.7)	222 (2.9)	271 (2.3)	276 (2.1)
Nation	45 (1.4)	17 (1.7)	22 (1.4)	37 (0.9)	46 (1.8)	42 (1.2)	18 (1.0)	37 (2.5)	36 (1.7)
	218 (1.2)	247 (2.9)	256 (2.5)	219 (1.1)	260 (1.4)	266 (1.4) >	215 (1.5)	272 (1.6)	273 (1.3)
PARENTS EDUCATION									
College grad									
State	54 (3.0)	17 (1.9)	24 (2.2)	31 (2.0)	48 (2.8)	39 (2.3)	14 (2.0)	35 (2.9)	37 (2.7)
	230 (2.4)	268 (4.5)	270 (3.4)	231 (2.4)	282 (2.3)	283 (2.0)	229 (4.7)	285 (2.9)	288 (2.5)
Nation	46 (1.9)	18 (2.1)	21 (1.9)	37 (1.3)	41 (2.2)	42 (1.5)	18 (1.4)	41 (2.6)	37 (2.3)
	225 (1.7)	257 (2.9)	267 (4.1)	225 (1.5)	272 (2.1)	278 (1.9)	222 (2.3)	286 (2.3)	286 (1.9)
Some college									
State	47 (4.0)	18 (2.7)	23 (2.5)	37 (3.5)	46 (2.8)	46 (2.6)	15 (2.6)	36 (3.1)	32 (2.7)
	235 (3.4)	263 (4.1)	263 (4.0)	239 (2.6)	270 (2.3)	274 (2.4)	*** (**.*)	276 (2.3)	282 (2.4)
Nation	43 (3.1)	13 (2.1)	20 (1.9)	38 (2.9)	46 (3.1)	41 (1.9)	18 (2.7)	40 (3.6)	39 (2.3)
	225 (2.4)	247 (4.6)	257 (3.1)	220 (3.0)	269 (2.3)	271 (1.8)	224 (5.6)	271 (2.6)	276 (1.7)
HS graduate									
State	50 (3.3)	16 (1.7)	24 (2.5)	36 (2.6)	46 (2.5)	43 (2.2)	15 (2.7)	38 (3.0)	33 (2.7)
	221 (2.5)	249 (3.4)	253 (3.0)	220 (2.3)	256 (2.2)	263 (1.9)	220 (5.3)	261 (2.5)	267 (3.0)
Nation	44 (2.7)	17 (2.7)	21 (1.6)	36 (2.3)	51 (3.2)	45 (1.5)	19 (1.8)	32 (3.6)	34 (1.8)
	211 (2.2)	242 (3.9)	247 (2.7)	213 (2.4)	255 (2.2)	255 (1.7)	215 (2.9)	262 (2.2)	262 (2.2)
HS non-grad									
State	54 (5.8)	19 (3.7)	28 (3.9)	30 (5.0)	49 (4.9)	42 (4.2)	16 (4.0)	32 (4.3)	30 (3.4)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	243 (3.6)	251 (4.1)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	41 (4.2)	20 (3.6)	25 (2.2)	36 (4.1)	51 (3.0)	40 (2.8)	22 (3.2)	29 (4.0)	35 (2.9)
	199 (4.4)	*** (**.*)	245 (3.7)	207 (3.9)	239 (3.0)	248 (2.8)	203 (4.4)	253 (3.4)	252 (3.2)
Don't know									
State	50 (2.4)	25 (4.4)	26 (4.2)	35 (1.7)	52 (4.8)	39 (3.9)	15 (1.6)	23 (4.6)	34 (4.1)
	215 (2.6)	*** (**.*)	*** (**.*)	217 (2.2)	*** (**.*)	*** (**.*)	213 (2.8)	*** (**.*)	*** (**.*)
Nation	45 (1.7)	20 (3.3)	27 (2.3)	36 (1.2)	46 (3.6)	41 (2.3)	19 (1.2)	34 (3.5)	32 (2.4)
	212 (1.4)	*** (**.*)	242 (3.2)	214 (1.4)	239 (3.0)	253 (2.4) >	208 (1.5)	244 (4.5)	255 (2.5)
GENDER									
Male									
State	51 (2.2)	18 (1.6)	25 (2.1) >	34 (1.5)	46 (2.5)	42 (2.3)	14 (1.6)	36 (2.9)	33 (2.4)
	224 (2.0)	259 (3.5)	264 (3.0)	226 (2.1)	270 (2.0)	274 (1.8)	221 (3.0)	274 (2.8)	279 (2.6)
Nation	45 (1.7)	19 (1.6)	22 (1.4)	36 (1.3)	46 (1.9)	42 (1.6)	18 (1.1)	35 (2.7)	35 (1.9)
	219 (1.4)	247 (3.4)	254 (2.2)	220 (1.6)	261 (2.1)	266 (1.6)	215 (1.4)	274 (2.3)	273 (1.8)
Female									
State	52 (2.7)	17 (1.9)	23 (2.1)	33 (1.9)	48 (2.1)	42 (1.8)	15 (1.8)	35 (2.3)	35 (2.3)
	223 (2.0)	254 (3.3)	255 (2.8)	222 (2.0)	264 (2.5)	268 (2.1)	222 (3.5)	268 (2.5)	277 (2.4) >
Nation	45 (1.6)	16 (1.8)	21 (1.6)	37 (1.1)	46 (2.3)	42 (1.3)	19 (1.3)	38 (2.6)	37 (1.8)
	216 (1.4)	247 (3.9)	257 (3.2)	217 (1.4)	259 (1.7)	266 (1.6) >	216 (2.4)	270 (2.3)	274 (1.7)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A25A | Teachers' Reports on the Frequency of Calculator Use

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**			**Percentage of Students and Average Math Proficiency**		
TOTAL									
State	18 (3.2)	28 (3.5)	46 (4.2) >	34 (3.7)	36 (3.2)	24 (2.9) <	48 (3.8)	36 (4.1)	30 (3.4)
	232 (2.9)	271 (2.6)	276 (2.2)	227 (2.1)	267 (2.8)	267 (2.7)	217 (2.0)	265 (2.2)	267 (2.6)
Nation	18 (2.3)	43 (4.6)	56 (3.0)	34 (2.1)	38 (4.3)	21 (2.2) <	48 (2.9)	18 (4.0)	23 (2.5)
	222 (3.1)	269 (2.9)	274 (1.5)	220 (1.6)	258 (2.3)	257 (2.3)	213 (1.5)	258 (4.6)!	263 (2.2)
RACE/ ETHNICITY									
White									
State	19 (3.6)	28 (3.7)	45 (4.4) >	36 (4.1)	36 (3.3)	24 (3.1)	44 (4.0)	36 (4.3)	31 (3.5)
	237 (3.0)	276 (2.1)	281 (1.8)	231 (1.8)	273 (2.3)	271 (2.7)	226 (1.5)	270 (1.8)	272 (2.1)
Nation	17 (2.8)	45 (5.2)	59 (3.5)	37 (2.5)	38 (4.8)	19 (2.7) <	45 (3.2)	17 (4.5)	22 (3.0)
	233 (2.8)	275 (3.0)	282 (1.6)	226 (1.5)	263 (2.7)	269 (2.3)	222 (1.4)	270 (3.6)!	273 (2.4)
Black									
State	8 (3.0)	26 (6.8)	46 (8.3)	21 (5.1)	33 (9.0)	22 (5.9)	71 (6.3)	41 (8.0)	32 (8.0)
	*** (**.*)	*** (**.*)	244 (8.4)!	201 (5.0)!	235 (4.9)!	*** (**.*)	189 (3.5)	239 (5.0)!	231 (6.1)!
Nation	19 (3.8)	29 (6.0)	44 (3.8)	26 (4.0)	42 (7.9)	32 (4.1)	55 (5.1)	29 (7.9)	24 (3.0)
	190 (2.9)!	246 (3.6)!	243 (2.3)	193 (2.7)	242 (3.7)!	233 (2.5)	191 (2.5)	229 (8.6)!	234 (3.5)
Hispanic									
State	17 (5.3)	41 (7.6)	60 (7.9)!	37 (5.8)	35 (10.1)	15 (4.8)!	46 (6.4)	24 (5.0)	26 (6.4)!
	*** (**.*)	*** (**.*)	*** (**.*)	209 (5.8)!	*** (**.*)	*** (**.*)	200 (4.4)	*** (**.*)	*** (**.*)
Nation	18 (2.8)	44 (5.7)	47 (4.7)	27 (3.9)	42 (5.7)	25 (2.4) <	55 (4.6)	13 (3.5)	28 (5.1)
	202 (3.9)	244 (5.0)	251 (2.5)	198 (3.6)	251 (3.7)!	238 (3.3)	198 (2.3)	*** (**.*)	245 (3.4)
TYPE OF COMMUNITY									
Adv. urban									
State	40 (13.7)!	39 (10.2)!	61 (11.8)!	19 (9.3)!	49 (7.4)!	12 (8.4)! <	41 (10.2)!	12 (5.8)!	27 (15.9)!
	242 (11.9)!	291 (5.2)!	*** (**.*)	*** (**.*)	283 (2.8)!	*** (**.*)	231 (9.9)!	*** (**.*)	*** (**.*)
Nation	34 (10.2)!	69 (20.7)!	62 (10.0)!	23 (7.8)!	4 (2.8)!	9 (2.8)!	44 (10.7)!	27 (20.3)!	30 (9.8)!
	*** (**.*)	288 (6.0)!	297 (5.9)!	*** (**.*)	*** (**.*)	*** (**.*)	234 (4.4)!	*** (**.*)	265 (5.2)!
Disadv. urban									
State	9 (4.2)	52 (10.0)!	40 (13.6)!	21 (5.8)	28 (9.5)!	25 (9.1)!	70 (7.9)	21 (6.5)!	35 (11.6)!
	*** (**.*)	261 (5.6)!	253 (8.4)!	193 (4.7)!	*** (**.*)	244 (3.8)!	195 (4.9)!	*** (**.*)	238 (7.9)!
Nation	26 (6.5)	48 (11.8)!	38 (8.3)	20 (5.7)	39 (12.1)!	41 (8.9)	53 (7.7)	13 (6.6)!	21 (6.8)
	195 (7.0)!	257 (4.3)!	247 (5.3)!	191 (6.6)!	247 (11.9)!	238 (5.0)!	195 (2.5)!	*** (**.*)	235 (6.2)!
Extreme rural									
State	10 (6.9)!	10 (8.9)!	37 (11.6)!	36 (10.6)!	22 (11.8)!	17 (7.2)!	53 (14.4)!	69 (15.3)!	46 (13.4)!
	*** (**.*)	*** (**.*)	282 (9.0)!	232 (3.6)!	*** (**.*)	*** (**.*)	228 (2.4)!	269 (4.9)!	274 (4.3)!
Nation	12 (4.2)	28 (16.5)!	44 (11.9)!	42 (7.3)	35 (9.9)!	24 (11.2)!	45 (8.0)	37 (17.0)!	32 (14.1)!
	*** (**.*)	*** (**.*)	273 (4.4)!	222 (2.7)!	257 (2.7)!	264 (9.7)!	204 (5.3)!	267 (7.1)!	259 (6.0)!
Other									
State	17 (4.1)	21 (3.6)	47 (5.3) >	40 (5.2)	36 (4.1)	23 (3.9)	43 (6.1)	43 (5.8)	30 (4.4)
	231 (3.8)!	270 (2.6)	278 (2.0)	228 (2.3)	270 (3.0)	272 (2.5)	223 (2.1)	266 (2.6)	272 (2.4)
Nation	16 (2.8)	41 (5.1)	58 (3.2) >	35 (3.2)	44 (5.6)	20 (2.2) <	48 (3.7)	16 (4.5)	21 (2.5)
	220 (3.1)	268 (3.1)	274 (1.5)	220 (1.9)	260 (2.7)	259 (2.4)	216 (1.7)	256 (6.4)!	267 (3.0)

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TABLE A25A (continued)

Teachers' Reports on the Frequency of Calculator Use

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	18 (3.2)	28 (3.5)	46 (4.2) >	34 (3.7)	36 (3.2)	24 (2.9) <	48 (3.8)	36 (4.1)	30 (3.4)
	232 (2.9)	271 (2.6)	276 (2.2)	227 (2.1)	267 (2.8)	267 (2.7)	217 (2.0)	265 (2.2)	267 (2.6)
Nation	18 (2.3)	43 (4.6)	56 (3.0)	34 (2.1)	38 (4.3)	21 (2.2) <	48 (2.9)	18 (4.0)	23 (2.5)
	222 (3.1)	269 (2.9)	274 (1.5)	220 (1.6)	258 (2.3)	257 (2.3)	213 (1.5)	258 (4.6)!	263 (2.2)
PARENTS EDUCATION									
College grad.									
State	19 (3.6)	31 (4.3)	51 (4.4) >	35 (3.9)	36 (3.6)	23 (3.2)	46 (3.8)	33 (3.8)	26 (3.1)
	242 (3.5)!	283 (4.1)	286 (2.4)	233 (2.8)	284 (2.8)	281 (3.7)	223 (3.1)	278 (3.0)	275 (2.7)
Nation	20 (2.8)	48 (5.3)	62 (3.4)	35 (2.9)	35 (4.6)	17 (1.9) <	45 (3.6)	17 (4.1)	21 (2.5)
	232 (3.9)	281 (3.2)	286 (1.8)	225 (2.0)	269 (3.2)	267 (3.4)	219 (2.2)	269 (5.0)!	274 (2.9)
Some college									
State	17 (4.2)	29 (4.2)	43 (5.4)	44 (5.3)	37 (4.1)	23 (3.1)	39 (4.9)	35 (4.4)	35 (4.6)
	*** (**.*)	274 (2.4)	276 (2.7)	240 (4.2)	269 (2.9)	270 (2.9)	228 (3.2)	271 (2.8)	273 (3.6)
Nation	14 (2.3)	42 (6.1)	57 (3.9)	37 (4.0)	40 (5.1)	20 (2.6) <	49 (3.8)	18 (5.7)	23 (3.4)
	*** (**.*)	274 (3.1)	274 (1.6)	227 (3.9)	265 (3.4)	264 (3.2)	220 (2.9)	*** (**.*)	268 (3.4)
HS graduate									
State	15 (2.9)	24 (3.6)	40 (4.3)	35 (4.9)	36 (3.8)	26 (3.5)	50 (5.0)	40 (4.8)	34 (4.1)
	*** (**.*)	260 (3.3)	268 (2.6)	223 (2.8)	255 (2.9)	256 (2.8)	216 (2.6)	256 (2.4)	260 (3.4)
Nation	17 (3.5)	37 (5.3)	50 (3.0)	31 (3.1)	44 (5.3)	25 (3.0) <	52 (4.1)	19 (4.5)	25 (2.9)
	221 (5.9)!	261 (3.4)	262 (1.8)	215 (2.7)	248 (2.6)	250 (3.2)	209 (2.5)	257 (6.0)!	256 (2.3)
HS non-grad.									
State	12 (3.9)	30 (4.9)	50 (7.1)	30 (5.4)	27 (6.2)	23 (5.4)	58 (6.2)	43 (7.2)	27 (5.2)
	*** (**.*)	*** (**.*)	258 (3.2)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	15 (3.5)	38 (5.8)	44 (3.6)	29 (4.6)	41 (6.7)	26 (4.8)	56 (4.9)	22 (6.5)	30 (5.1)
	*** (**.*)	245 (4.0)	254 (2.4)	*** (**.*)	247 (3.8)	247 (4.7)!	199 (3.3)	*** (**.*)	245 (2.5)
Don't know									
State	19 (4.3)	23 (6.7)	46 (6.2)	32 (4.1)	41 (6.7)	21 (4.6)	49 (4.6)	36 (6.5)	33 (5.4)
	220 (4.1)!	*** (**.*)	*** (**.*)	220 (3.0)	*** (**.*)	*** (**.*)	210 (2.0)	*** (**.*)	*** (**.*)
Nation	17 (2.3)	45 (5.7)	49 (3.7)	34 (2.2)	35 (5.5)	30 (3.2)	49 (2.8)	20 (5.3)	21 (2.9)
	213 (3.3)	241 (7.0)	257 (2.4)	215 (1.8)	243 (4.6)	246 (2.6)	210 (1.6)	*** (**.*)	250 (5.8)
GENDER									
Male									
State	18 (3.7)	28 (3.8)	44 (4.2) >	35 (4.1)	35 (3.4)	24 (3.0)	47 (4.1)	37 (4.5)	31 (3.5)
	229 (3.6)!	272 (3.1)	278 (2.0)	230 (2.5)	270 (3.0)	272 (3.2)	218 (2.3)	268 (2.6)	267 (3.2)
Nation	19 (2.5)	46 (4.9)	55 (3.1)	34 (2.4)	35 (4.3)	23 (2.3) <	47 (3.1)	18 (3.8)	22 (2.5)
	224 (4.0)	268 (3.2)	273 (1.7)	221 (1.7)	260 (2.8)	257 (2.5)	213 (1.4)	258 (5.4)	264 (2.5)
Female									
State	18 (3.0)	28 (3.5)	47 (4.4) >	34 (3.5)	36 (3.4)	23 (2.9) <	48 (3.7)	36 (3.8)	30 (3.5)
	234 (3.1)	269 (3.0)	273 (2.8)	224 (2.4)	265 (3.2)	261 (2.6)	216 (2.2)	261 (2.6)	266 (2.6)
Nation	17 (2.4)	40 (4.7)	56 (3.1) >	34 (2.1)	41 (4.7)	20 (2.2) <	49 (2.8)	19 (4.5)	24 (2.7)
	220 (3.1)	270 (3.1)	275 (1.8)	218 (2.2)	256 (2.3)	258 (2.6)	213 (1.8)	258 (4.7)!	262 (2.7)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A25B | Students' Reports on the Frequency of Calculator Use

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	28 (2.0)	26 (2.4)	42 (3.0) >	24 (1.5)	22 (1.3)	20 (1.3)	48 (2.5)	52 (2.6)	38 (2.7) <
	220 (2.4)	267 (2.2)	274 (2.1)	230 (2.2)	273 (2.0)	270 (2.4)	222 (1.5)	264 (2.2)	268 (1.9)
Nation	22 (1.2)	40 (3.1)	53 (2.1) >	21 (1.4)	21 (1.4)	18 (0.9)	57 (1.9)	39 (3.1)	29 (1.6) <
	215 (1.9)	266 (2.3)	272 (1.4)	227 (1.2)	264 (2.0)	263 (1.6)	215 (1.0)	257 (1.4)	259 (1.6)
RACE/ ETHNICITY									
White									
State	28 (2.2)	27 (2.6)	42 (3.2) >	26 (1.7)	23 (1.5)	21 (1.5)	46 (2.7)	50 (2.6)	37 (2.9) <
	228 (2.4)	272 (1.6)	278 (1.7)	235 (2.1)	277 (1.7)	276 (2.3)	229 (1.3)	270 (1.8)	273 (1.7)
Nation	20 (1.3)	42 (3.5)	57 (2.5) >	24 (1.9)	20 (1.7)	17 (1.1)	55 (2.4)	38 (3.4)	26 (1.8) <
	227 (2.3)	273 (2.3)	280 (1.5)	232 (1.1)	272 (2.1)	274 (1.5)	224 (1.1)	266 (1.7)	270 (2.0)
Black									
State	30 (3.5)	22 (5.6)	42 (6.0)	15 (2.1)	14 (3.0)	19 (2.5)	56 (4.1)	64 (7.2)	39 (5.0) <
	189 (4.5)	*** (**.*)	240 (7.5)	*** (**.*)	*** (**.*)	*** (**.*)	193 (2.9)	240 (4.4)!	235 (3.9)
Nation	27 (1.8)	28 (3.6)	44 (2.7) >	13 (1.5)	23 (2.9)	20 (1.9)	60 (2.6)	49 (6.0)	36 (2.4)
	187 (2.3)	236 (2.7)	241 (1.9)	199 (3.5)	242 (4.4)	235 (3.0)	192 (1.9)	236 (3.7)	232 (1.8)
Hispanic									
State	31 (4.3)	27 (4.8)	34 (6.1)!	23 (2.9)	19 (3.2)	19 (4.4)!	46 (4.5)	54 (6.1)	47 (6.5)!
	199 (4.6)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	203 (3.2)	*** (**.*)	*** (**.*)
Nation	25 (2.0)	43 (4.4)	41 (2.5)	15 (1.4)	21 (2.7)	20 (1.6)	61 (2.7)	36 (4.8)	39 (3.0)
	195 (2.7)	243 (4.5)	248 (2.1)	208 (2.8)	250 (4.9)	245 (2.8)	200 (1.7)	237 (2.9)	241 (2.4)
TYPE OF COMMUNITY									
Adv. urban									
State	36 (8.2)!	40 (6.6)!	54 (7.3)!	25 (3.4)!	32 (4.1)!	19 (3.7)!	38 (6.7)!	27 (4.2)!	27 (8.8)!
	235 (7.8)!	285 (3.0)!	*** (**.*)	239 (6.6)!	292 (3.1)!	*** (**.*)	240 (3.2)!	289 (5.2)!	*** (**.*)
Nation	25 (5.4)!	59 (16.7)!	58 (7.6)!	25 (4.4)!	14 (3.9)!	16 (3.7)!	49 (6.0)!	27 (15.0)!	27 (4.6)!
	250 (6.0)!	286 (6.5)!	291 (5.3)!	244 (3.9)!	*** (**.*)	278 (7.8)!	234 (3.1)!	*** (**.*)	276 (5.6)!
Disadv. urban									
State	27 (3.7)	31 (6.8)!	34 (7.0)!	15 (2.2)	16 (4.0)!	25 (3.4)!	59 (5.1)	54 (8.7)!	42 (6.3)!
	189 (4.5)	257 (5.9)!	245 (8.1)!	199 (4.2)!	*** (**.*)	242 (7.1)!	199 (4.5)!	237 (5.7)!	246 (5.1)!
Nation	27 (3.3)	36 (6.7)!	37 (3.0)	11 (1.2)	22 (4.0)!	22 (3.6)	62 (3.8)	42 (8.2)!	41 (3.9)
	189 (5.2)!	252 (3.6)!	243 (3.8)	196 (4.9)!	255 (5.2)!	236 (3.6)! <	195 (2.7)	245 (5.4)!	236 (3.4)
Extreme rural									
State	25 (3.7)!	13 (2.2)!	41 (10.2)!	23 (5.8)!	24 (5.2)!	11 (2.6)!	52 (7.6)!	62 (7.1)!	46 (9.7)!
	228 (3.4)!	*** (**.*)	281 (7.0)!	230 (3.3)!	*** (**.*)	*** (**.*)	231 (2.3)!	269 (4.3)!	273 (4.5)!
Nation	18 (2.1)	19 (7.1)!	43 (8.6)!	29 (3.7)	22 (4.5)!	16 (2.6)!	53 (4.8)	59 (9.9)!	41 (7.4)!
	213 (6.8)!	*** (**.*)	271 (4.4)!	226 (2.3)	*** (**.*)	265 (5.5)!	212 (4.4)!	258 (5.3)!	264 (5.4)!
Other									
State	28 (2.6)	21 (2.8)	40 (3.8) >	27 (2.4)	22 (1.7)	21 (2.0)	46 (3.7)	57 (3.4)	38 (3.5) <
	222 (2.5)	266 (2.1)	277 (2.2) >	233 (2.4)	272 (2.2)	276 (2.1)	225 (2.0)	266 (2.2)	272 (1.9)
Nation	21 (1.4)	41 (3.1)	56 (2.5) >	21 (1.6)	21 (1.8)	18 (1.1)	57 (2.2)	38 (3.3)	27 (2.0) <
	215 (1.9)	265 (2.4)	272 (1.4)	227 (1.3)	264 (2.5)	266 (1.6)	217 (1.2)	258 (2.1)	261 (2.0)

(continued on next page)

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TABLE A25B (continued)

Students' Reports on the Frequency of Calculator Use

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	28 (2.0) 220 (2.4)	26 (2.4) 267 (2.2)	42 (3.0) > 274 (2.1)	24 (1.5) 230 (2.2)	22 (1.3) 273 (2.0)	20 (1.3) 270 (2.4)	48 (2.5) 222 (1.5)	52 (2.6) 264 (2.2)	38 (2.7) < 268 (1.9)
Nation	22 (1.2) 215 (1.9)	40 (3.1) 266 (2.3)	53 (2.1) > 272 (1.4)	21 (1.4) 227 (1.2)	21 (1.4) 264 (2.0)	18 (0.9) 263 (1.6)	57 (1.9) 215 (1.0)	39 (3.1) 257 (1.4)	29 (1.6) < 259 (1.6)
PARENTS' EDUCATION									
College grad									
State	29 (2.1) 227 (3.7)	28 (3.1) 279 (3.6)	44 (3.5) > 284 (2.4)	25 (1.9) 235 (2.3)	24 (1.4) 287 (2.9)	21 (1.8) 285 (2.7)	46 (2.8) 229 (2.2)	48 (2.9) 279 (2.3)	35 (2.7) < 277 (2.2)
Nation	25 (1.8) 224 (3.0)	43 (3.7) 278 (2.7)	60 (2.6) > 282 (1.8)	23 (1.8) 233 (1.7)	20 (1.5) 274 (2.5)	17 (1.2) 273 (2.4)	53 (2.3) 222 (1.3)	37 (3.7) 271 (2.1)	23 (1.8) < 274 (2.4)
Some college									
State	25 (3.5) 231 (6.1)	26 (3.3) 271 (2.9)	40 (3.6) 277 (2.7)	29 (2.7) 241 (3.4)	24 (2.5) 272 (3.6)	20 (2.3) 266 (3.4)	46 (4.2) 236 (3.0)	50 (3.6) 270 (2.4)	39 (3.7) 274 (2.5)
Nation	18 (2.3) 215 (5.3)	38 (4.1) 271 (3.1)	54 (2.8) > 273 (1.8)	22 (2.1) 232 (4.2)	23 (2.1) 271 (3.2)	19 (1.6) 269 (2.8)	60 (3.0) 223 (2.2)	39 (4.1) 261 (2.5)	28 (2.5) 265 (2.7)
HS graduate									
State	30 (2.9) 216 (2.7)	25 (2.6) 258 (2.4)	39 (3.3) > 266 (2.7)	22 (2.2) 224 (3.4)	20 (1.5) 262 (2.9)	20 (1.9) 261 (3.6)	48 (2.9) 222 (2.3)	56 (2.9) 254 (2.4)	41 (3.0) < 259 (2.2)
Nation	21 (2.1) 207 (3.9)	38 (3.3) 257 (2.8)	50 (2.2) > 260 (1.5)	21 (1.6) 224 (3.2)	21 (2.4) 257 (2.7)	19 (1.3) 253 (2.9)	58 (2.8) 210 (2.2)	41 (3.8) 252 (2.7)	31 (1.7) 251 (2.4)
HS non-grad									
State	22 (3.6) *** (**.*)	24 (3.5) *** (**.*)	42 (5.3) 258 (4.0)	28 (4.4) *** (**.*)	23 (3.2) *** (**.*)	18 (3.1) *** (**.*)	50 (4.7) *** (**.*)	53 (4.6) 245 (3.6)	40 (5.0) 248 (4.1)
Nation	15 (2.2) *** (**.*)	41 (4.7) 241 (3.3)	35 (3.9) 252 (2.1)	21 (2.3) *** (**.*)	17 (2.1) *** (**.*)	17 (2.0) 250 (4.4)	64 (3.1) 203 (3.2)	42 (5.0) 238 (2.3)	48 (3.8) 245 (2.3)
Don't know									
State	28 (2.9) 213 (3.4)	20 (4.3) *** (**.*)	45 (4.7) > *** (**.*)	23 (1.9) 223 (3.0)	16 (3.8) *** (**.*)	21 (4.0) *** (**.*)	49 (3.0) 214 (1.9)	64 (6.2) 241 (4.8)	34 (4.6) < *** (**.*)
Nation	21 (1.3) 208 (2.0)	36 (4.3) 247 (5.3)	46 (2.7) 255 (2.4)	20 (1.7) 221 (1.8)	22 (3.1) 245 (4.1)	18 (2.0) 252 (3.1)	59 (2.1) 211 (1.0)	43 (4.3) 232 (3.3)	37 (2.7) 246 (2.9) >
GENDER									
Male									
State	28 (2.3) 219 (2.9)	27 (2.4) 269 (2.7)	40 (3.0) > 276 (2.1)	25 (2.0) 229 (2.5)	23 (1.6) 275 (2.5)	23 (1.5) 272 (3.0)	48 (2.7) 225 (1.9)	51 (2.6) 267 (2.2)	37 (2.8) < 271 (2.0)
Nation	21 (1.4) 217 (2.1)	42 (3.3) 266 (2.5)	53 (2.3) > 271 (1.8)	22 (1.7) 228 (1.6)	21 (1.3) 266 (2.5)	19 (1.2) 263 (1.9)	57 (2.2) 217 (0.9)	37 (3.1) 258 (1.8)	28 (1.7) < 260 (1.9)
Female									
State	29 (2.1) 222 (2.7)	25 (2.8) 265 (2.5)	44 (3.4) > 271 (2.6)	24 (1.5) 230 (2.5)	21 (1.3) 270 (2.7)	18 (1.4) 268 (2.7)	48 (2.5) 219 (1.7)	54 (3.0) 261 (2.6)	38 (3.0) < 265 (2.3)
Nation	22 (1.2) 213 (2.4)	38 (3.3) 266 (2.7)	53 (2.2) > 273 (1.5)	21 (1.3) 226 (2.1)	20 (1.8) 262 (2.1)	16 (1.0) 263 (2.2)	56 (1.8) 214 (1.4)	42 (3.4) 257 (1.7)	31 (1.7) < 258 (2.0)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A27A | Teachers' Reports on the Frequency of Computer Use in Mathematics Classrooms

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	42 (4.1) 224 (2.2)	5 (1.4) 259 (11.2)!	5 (1.4) 259 (5.7)!	26 (3.3) 226 (2.5)	40 (4.0) 269 (2.0)	21 (3.6) < 277 (3.1)	32 (4.2) 220 (3.3)	55 (4.3) 266 (2.7)	74 (4.2) > 270 (1.6)
Nation	55 (3.3) 218 (1.5)	12 (3.5) 246 (5.2)!	8 (1.3) 252 (3.9)	20 (2.2) 218 (2.8)	34 (4.5) 264 (3.1)	18 (2.1) < 266 (2.3)	24 (2.9) 214 (2.5)	54 (4.2) 266 (2.2)	74 (2.1) > 270 (1.4)
RACE/ ETHNICITY									
White									
State	43 (4.3) 231 (1.8)	5 (1.5) 268 (7.5)!	4 (1.6) 265 (4.7)!	28 (3.6) 230 (2.2)	42 (4.3) 273 (1.7)	22 (3.6) < 280 (2.7)	30 (4.4) 230 (2.1)	54 (4.6) 273 (1.9)	74 (4.2) > 275 (1.4)
Nation	56 (3.5) 225 (1.6)	11 (3.8) 251 (5.9)!	8 (1.4) 267 (4.8)!	21 (2.8) 226 (3.2)	34 (4.7) 271 (3.2)	18 (2.6) < 275 (2.2)	22 (3.0) 226 (2.1)	54 (4.4) 272 (2.0)	76 (2.5) > 278 (1.4)
Black									
State	41 (10.0) 195 (2.5)!	5 (4.1) *** (**.*)	12 (5.8) *** (**.*)	16 (5.4) *** (**.*)	29 (9.2) 246 (4.0)!	17 (6.7) *** (**.*)	44 (10.7) 186 (3.5)!	66 (9.8) 237 (4.3)!	71 (9.2) 234 (3.9)!
Nation	49 (5.8) 192 (2.2)	19 (7.0) *** (**.*)	13 (2.9) 231 (3.3)!	17 (2.6) 195 (2.7)	29 (8.4) 240 (3.5)!	20 (2.8) 239 (2.9)	33 (6.2) 189 (2.9)!	52 (7.7) 242 (5.0)	67 (4.3) 238 (2.1)
Hispanic									
State	36 (6.0) 204 (4.5)!	6 (4.3) *** (**.*)	7 (3.3)! *** (**.*)	30 (4.8) *** (**.*)	37 (8.6) *** (**.*)	14 (5.1)! *** (**.*)	34 (6.4) 200 (5.2)	57 (10.8) *** (**.*)	78 (6.7)! 246 (4.7)!
Nation	58 (3.8) 203 (2.2)	10 (3.2) *** (**.*)	13 (2.1) 232 (4.6)	20 (2.2) 192 (2.7)	26 (7.4) 245 (4.3)!	14 (3.7) 240 (4.7)!	22 (3.2) 193 (4.0)	64 (7.7) 248 (4.4)	72 (4.1) 249 (1.6)
TYPE OF COMMUNITY									
Adv. urban									
State	53 (15.1)! 241 (7.2)!	11 (5.3)! *** (**.*)	0 (0.0)! *** (**.*)	24 (7.5)! 236 (17.8)!	38 (11.9)! 284 (4.7)!	48 (36.4)! *** (**.*)	23 (10.3)! 237 (4.2)!	51 (13.3)! 287 (3.8)!	52 (36.4)! *** (**.*)
Nation	51 (11.1)! 239 (4.4)!	2 (2.3)! *** (**.*)	4 (2.5)! *** (**.*)	30 (9.4)! *** (**.*)	20 (15.8)! *** (**.*)	25 (7.2)! 273 (7.4)!	19 (8.9)! *** (**.*)	78 (15.2)! 283 (4.7)!	71 (8.5)! 290 (4.5)!
Disadv. urban									
State	46 (10.7) 199 (5.2)!	7 (5.5)! *** (**.*)	6 (4.6)! *** (**.*)	11 (4.3) *** (**.*)	32 (10.5)! 261 (5.5)!	21 (11.0)! *** (**.*)	43 (11.8) 191 (7.6)!	61 (11.6)! 245 (7.7)!	72 (11.3)! 242 (5.6)!
Nation	57 (7.1) 196 (3.6)!	27 (13.4)! 234 (9.2)!	18 (7.3) 232 (5.0)!	17 (5.5) 202 (5.8)!	34 (12.5)! 253 (8.2)!	9 (3.6) *** (**.*)	26 (6.2) 185 (4.4)!	39 (13.1)! 258 (4.9)!	73 (7.9) 243 (3.7)!
Extreme rural									
State	31 (9.2)! 230 (3.1)!	1 (0.5)! *** (**.*)	11 (7.7)! *** (**.*)	36 (7.9)! 227 (4.5)!	28 (12.3)! *** (**.*)	17 (9.7)! *** (**.*)	34 (10.8)! 232 (3.0)!	72 (12.6)! 269 (5.1)!	72 (14.1)! 278 (3.5)!
Nation	65 (9.1) 219 (3.4)!	2 (1.6)! *** (**.*)	12 (5.7)! *** (**.*)	16 (6.0) 224 (7.8)!	21 (16.6)! *** (**.*)	21 (9.5)! 268 (6.0)!	20 (8.5) 193 (5.4)!	77 (17.1)! 262 (4.1)!	67 (9.7)! 267 (6.2)!
Other									
State	40 (5.9) 226 (2.0)	4 (1.6) *** (**.*)	5 (2.1) 269 (5.8)!	31 (4.9) 228 (2.9)!	43 (5.6) 270 (2.1)	21 (4.3) < 279 (3.4)!	29 (5.6) 225 (3.4)!	53 (5.8) 268 (2.5)	74 (5.1) 275 (1.6)
Nation	54 (3.7) 218 (1.7)	13 (4.6) 249 (5.9)!	7 (1.4) 254 (3.9)!	20 (2.5) 215 (2.6)	38 (5.4) 266 (3.3)	18 (2.3) < 265 (2.3)	26 (3.3) 219 (2.5)	49 (4.9) 263 (2.8)	75 (2.6) > 271 (1.5)

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TABLE A27A (continued) | Teachers' Reports on the Frequency of Computer Use in Mathematics Classrooms

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	42 (4.1)	5 (1.4)	5 (1.4)	26 (3.3)	40 (4.0)	21 (3.6) <	32 (4.2)	55 (4.3)	74 (4.2) >
	224 (2.2)	259 (11.2)!	259 (5.7)!	226 (2.5)	269 (2.0)	277 (3.1)	220 (3.3)	266 (2.7)	270 (1.6)
Nation	55 (3.3)	12 (3.5)	8 (1.3)	20 (2.2)	34 (4.5)	18 (2.1) <	24 (2.9)	54 (4.2)	74 (2.1) >
	218 (1.5)	246 (5.2)!	252 (3.9)	218 (2.8)	264 (3.1)	266 (2.3)	214 (2.5)	266 (2.2)	270 (1.4)
PARENTS' EDUCATION									
College grad									
State	40 (4.2)	5 (2.1)	4 (1.5)	27 (3.8)	41 (4.0)	25 (4.6)	33 (4.7)	54 (4.8)	71 (5.0)
	233 (2.8)	*** (**.*)	*** (**.*)	232 (3.2)	281 (2.7)	286 (3.3)!	226 (4.8)	281 (3.3)	281 (1.8)
Nation	54 (3.8)	10 (2.8)	7 (1.5)	21 (2.7)	33 (5.0)	19 (2.4)	25 (3.2)	57 (4.8)	74 (2.4) >
	225 (2.3)	281 (6.4)!	269 (4.6)!	226 (3.8)	275 (3.7)	275 (3.1)	220 (3.1)	276 (2.1)	282 (1.7)
Some college									
State	47 (5.6)	4 (1.5)	6 (2.0)	25 (4.7)	39 (4.7)	20 (4.2) <	28 (4.8)	57 (4.9)	74 (4.7)
	237 (3.9)	*** (**.*)	*** (**.*)	*** (**.*)	272 (2.3)	280 (3.9)!	231 (4.0)	271 (2.7)	273 (2.4)
Nation	50 (5.1)	8 (3.0)	8 (1.7)	23 (3.3)	36 (5.8)	20 (3.1)	27 (4.6)	56 (5.5)	72 (3.3)
	222 (3.0)	*** (**.*)	257 (6.0)!	221 (5.1)	265 (3.1)	271 (2.5)	224 (5.0)	274 (2.4)	272 (1.9)
HS graduate									
State	44 (5.2)	4 (1.3)	6 (2.0)	23 (3.5)	41 (5.1)	19 (3.2) <	33 (5.1)	55 (5.1)	75 (4.3) >
	218 (2.7)	*** (**.*)	*** (**.*)	222 (3.8)	259 (2.5)	267 (3.5)	221 (3.4)	256 (2.5)	262 (2.0)
Nation	58 (4.7)	13 (4.2)	8 (1.4)	19 (2.6)	39 (5.6)	16 (2.2) <	23 (3.8)	48 (5.3)	76 (2.5) >
	215 (2.0)	*** (**.*)	243 (4.9)	210 (5.8)	258 (3.1)	255 (3.1)	207 (4.2)	254 (2.5)	259 (1.7)
HS non-grad									
State	39 (6.3)	10 (4.0)	7 (2.2)	32 (6.0)	33 (6.0)	15 (4.2)	29 (5.4)	57 (7.6)	78 (5.0)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	249 (3.1)	251 (3.3)
Nation	54 (5.1)	23 (7.8)	10 (2.0)	18 (3.6)	28 (6.0)	16 (2.5)	28 (4.7)	49 (5.7)	74 (2.3) >
	201 (4.7)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	244 (4.8)	198 (4.6)	244 (4.0)	253 (2.2)
Don't know									
State	42 (4.4)	6 (3.2)	5 (2.2)	26 (3.4)	33 (7.1)	17 (4.2)	33 (4.4)	61 (7.9)	78 (4.8)
	215 (2.7)	*** (**.*)	*** (**.*)	220 (2.7)	*** (**.*)	*** (**.*)	212 (3.5)	*** (**.*)	252 (4.0)
Nation	58 (3.1)	17 (5.2)	11 (2.1)	19 (2.3)	29 (5.9)	17 (2.3)	23 (2.7)	55 (6.2)	71 (2.9)
	213 (1.5)	*** (**.*)	231 (5.6)	213 (2.7)	*** (**.*)	251 (4.1)	209 (2.9)	247 (5.1)	256 (2.2)
GENDER									
Male									
State	42 (4.2)	5 (1.5)	5 (1.3)	26 (3.4)	39 (4.1)	20 (3.4) <	32 (4.3)	56 (4.4)	76 (4.0) >
	225 (2.4)	*** (**.*)	260 (6.6)!	227 (2.8)	271 (2.3)	279 (3.2)	222 (3.5)	270 (2.8)	273 (1.8)
Nation	57 (3.3)	12 (3.5)	8 (1.3)	20 (2.4)	34 (4.4)	18 (2.1) <	23 (2.7)	54 (4.2)	74 (2.2) >
	219 (1.7)	245 (6.8)!	252 (4.8)	219 (3.0)	265 (3.8)	263 (3.0)	215 (3.0)	267 (2.6)	270 (1.6)
Female									
State	41 (4.2)	5 (1.4)	6 (1.8)	26 (3.4)	41 (4.2)	23 (4.0) <	33 (4.2)	54 (4.6)	71 (4.6) >
	224 (2.5)	*** (**.*)	258 (6.2)!	226 (2.7)	267 (2.3)	275 (3.7)	218 (3.6)	263 (2.9)	267 (1.8)
Nation	54 (3.6)	12 (4.0)	8 (1.3)	20 (2.2)	34 (4.8)	18 (2.3) <	26 (3.3)	54 (4.6)	74 (2.2) >
	216 (1.8)	247 (5.9)!	252 (4.2)	218 (3.3)	263 (3.3)	269 (2.4)	213 (2.7)	264 (2.3)	270 (1.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A27B | Students' Reports on the Frequency of Computer Use in Mathematics Classrooms

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	31 (2.2)	11 (1.1)	12 (1.1)	12 (0.8)	14 (1.6)	12 (1.3)	57 (2.2)	75 (2.1)	76 (1.6)
	222 (2.0)	257 (3.8)	262 (3.3)	230 (2.2)	270 (2.3)	272 (3.0)	224 (1.5)	268 (1.8)	272 (1.4)
Nation	33 (1.2)	15 (1.2)	15 (0.9)	9 (0.6)	14 (1.3)	12 (0.8)	58 (1.4)	70 (1.6)	73 (1.3)
	214 (1.1)	248 (2.4)	254 (1.9)	227 (1.8)	266 (2.8)	270 (2.2)	218 (1.0)	264 (1.4)	269 (1.0) >
RACE/ ETHNICITY									
White									
State	30 (2.4)	10 (1.1)	10 (0.9)	13 (0.9)	16 (1.8)	12 (1.5)	57 (2.4)	74 (2.4)	77 (1.8)
	229 (1.9)	263 (3.0)	271 (2.7)	236 (2.2)	273 (2.1)	277 (2.6)	230 (1.3)	273 (1.4)	277 (1.2)
Nation	30 (1.4)	12 (1.0)	13 (1.1)	10 (0.9)	16 (1.6)	13 (1.0)	59 (1.7)	72 (1.8)	75 (1.5)
	225 (1.3)	259 (3.0)	268 (2.4)	234 (2.2)	274 (2.8)	278 (1.9)	226 (1.1)	271 (1.6)	277 (1.1) >
Black									
State	37 (4.2)	16 (4.3)	20 (4.4)	8 (1.1)	7 (1.6)	9 (1.2)	55 (4.2)	78 (4.5)	72 (4.9)
	190 (3.4)	*** (**.*)	231 (5.7)!	*** (**.*)	*** (**.*)	*** (**.*)	195 (3.1)	241 (3.3)	239 (4.1)
Nation	42 (2.2)	25 (4.0)	23 (2.2)	6 (0.8)	9 (1.8)	10 (1.4)	52 (2.2)	66 (4.2)	67 (3.0)
	189 (1.9)	229 (3.1)	230 (2.5)	192 (5.5)	*** (**.*)	240 (3.5)	193 (1.9)	240 (3.5)	238 (1.5)
Hispanic									
State	29 (3.5)	16 (4.0)	20 (3.9)!	9 (2.3)	12 (2.6)	12 (3.5)!	62 (4.3)	73 (5.3)	68 (4.6)!
	200 (4.0)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	203 (2.6)	230 (4.9)!	*** (**.*)
Nation	35 (1.9)	19 (2.6)	22 (1.7)	8 (1.1)	13 (2.1)	9 (1.3)	57 (2.2)	68 (3.3)	69 (1.8)
	198 (2.3)	228 (4.0)	235 (2.6)	202 (4.1)	*** (**.*)	239 (4.1)	200 (1.9)	246 (3.2)	249 (1.7)
TYPE OF COMMUNITY									
Adv urban									
State	35 (6.6)!	8 (2.2)!	4 (0.3)!	18 (2.4)!	16 (2.5)!	22 (11.2)!	47 (6.9)!	77 (3.1)!	74 (11.1)!
	236 (7.0)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	237 (4.3)!	287 (2.7)!	*** (**.*)
Nation	29 (1.8)!	10 (2.9)!	11 (1.6)!	16 (2.7)!	15 (5.4)!	13 (2.7)!	55 (3.5)!	75 (4.7)!	76 (3.5)!
	234 (4.2)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	242 (4.0)!	282 (5.9)!	288 (4.4)!
Disadv urban									
State	40 (5.3)	12 (4.1)!	21 (5.0)!	9 (1.8)	7 (2.8)!	8 (1.1)!	51 (4.8)	81 (5.2)!	71 (5.5)!
	198 (5.4)!	*** (**.*)	241 (8.7)!	*** (**.*)	*** (**.*)	*** (**.*)	195 (4.0)	247 (5.8)!	247 (4.3)!
Nation	40 (3.2)	27 (6.1)!	24 (3.6)	6 (0.9)	12 (4.6)!	7 (1.5)	54 (3.1)	61 (7.0)!	68 (3.4)
	191 (3.2)	231 (3.6)!	230 (3.5)	*** (**.*)	*** (**.*)	236 (4.3)!	196 (3.0)	257 (5.3)!	242 (3.1)
Extreme rural									
State	28 (6.2)!	11 (4.1)!	8 (2.0)!	13 (2.7)!	11 (3.6)!	17 (6.8)!	60 (5.6)!	78 (7.1)!	75 (6.8)!
	229 (3.3)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	229 (2.9)!	286 (2.9)!	277 (4.1)!
Nation	38 (4.9)	10 (4.3)!	19 (5.0)!	9 (1.8)	12 (5.9)!	13 (3.1)!	53 (4.4)	77 (8.5)!	69 (6.4)!
	216 (3.8)!	*** (**.*)	265 (8.6)!	*** (**.*)	*** (**.*)	272 (3.8)!	215 (4.2)!	258 (4.6)!	267 (5.7)!
Other									
State	28 (3.2)	11 (1.4)	12 (1.2)	12 (1.0)	16 (2.5)	11 (1.6)	60 (3.0)	73 (3.2)	77 (2.0)
	225 (2.4)	256 (3.4)	268 (3.8)	233 (2.2)	268 (2.3)	273 (3.4)	226 (1.8)	269 (2.0)	276 (1.3) >
Nation	31 (1.7)	15 (1.3)	14 (0.9)	9 (0.8)	15 (1.6)	12 (0.9)	60 (1.9)	70 (1.9)	74 (1.5)
	216 (1.5)	250 (3.1)	256 (2.2)	226 (2.2)	268 (3.4)	271 (2.4)	219 (1.0)	263 (1.8)	270 (1.2) >

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TABLE A27B (continued) | Students' Reports on the Frequency of Computer Use in Mathematics Classrooms

	At Least Weekly			Less Than Once a Week			Never or Hardly Ever		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	31 (2.2)	11 (1.1)	12 (1.1)	12 (0.8)	14 (1.6)	12 (1.3)	57 (2.2)	75 (2.1)	76 (1.6)
	222 (2.0)	257 (3.8)	262 (3.3)	230 (2.2)	270 (2.3)	272 (3.0)	224 (1.5)	268 (1.8)	272 (1.4)
Nation	33 (1.2)	15 (1.2)	15 (0.9)	9 (0.6)	14 (1.3)	12 (0.8)	58 (1.4)	70 (1.6)	73 (1.3)
	214 (1.1)	248 (2.4)	254 (1.9)	227 (1.8)	268 (2.8)	270 (2.2)	218 (1.0)	264 (1.4)	269 (1.0) >
PARENTS' EDUCATION									
College grad									
State	32 (2.4)	11 (1.5)	11 (1.5)	14 (1.2)	15 (2.0)	11 (1.7)	54 (2.5)	74 (2.7)	78 (2.1)
	226 (2.9)	274 (5.3)	273 (3.9)	237 (3.0)	280 (3.3)	284 (4.3)	231 (2.1)	283 (2.2)	283 (1.5)
Nation	33 (1.6)	17 (1.5)	16 (1.0)	11 (0.9)	15 (1.8)	13 (1.0)	56 (1.9)	69 (2.1)	71 (1.3)
	221 (1.6)	260 (3.1)	266 (2.7)	233 (2.5)	281 (3.1)	279 (2.5)	226 (1.5)	277 (1.9)	282 (1.6)
Some college									
State	33 (4.4)	9 (1.1)	12 (1.6)	12 (2.3)	16 (2.1)	14 (2.0)	55 (4.9)	76 (2.5)	74 (2.2)
	234 (5.3)	*** (**.*)	266 (5.3)	*** (**.*)	272 (3.5)	*** (**.*)	238 (3.0)	272 (1.7)	274 (2.1)
Nation	33 (3.1)	13 (1.9)	15 (1.7)	10 (1.4)	14 (2.0)	12 (1.3)	56 (3.0)	73 (2.1)	73 (1.8)
	214 (3.1)	251 (5.4)	255 (3.0)	*** (**.*)	*** (**.*)	273 (3.3)	227 (2.3)	269 (1.6)	273 (1.4)
HS graduate									
State	30 (2.7)	11 (1.4)	12 (1.5)	13 (1.8)	14 (2.0)	12 (1.7)	58 (2.4)	75 (2.5)	76 (2.6)
	215 (3.1)	252 (3.9)	253 (4.6)	*** (**.*)	261 (3.4)	264 (3.5)	222 (1.9)	257 (1.9)	263 (1.7)
Nation	33 (2.1)	14 (1.8)	15 (1.5)	7 (1.3)	16 (2.3)	11 (1.2)	59 (2.1)	70 (2.5)	73 (2.1)
	212 (3.2)	245 (4.2)	244 (3.2)	*** (**.*)	257 (4.0)	259 (3.5)	213 (2.4)	256 (1.6)	258 (1.6)
HS non-grad									
State	24 (4.7)	15 (3.3)	16 (3.1)	12 (3.5)	9 (2.1)	13 (2.6)	65 (4.8)	76 (4.1)	72 (3.6)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	207 (4.2)	249 (2.8)	253 (3.4)
Nation	31 (3.8)	16 (2.8)	12 (1.6)	11 (2.3)	11 (2.3)	9 (1.7)	58 (4.3)	72 (3.3)	79 (2.4)
	192 (4.2)	*** (**.*)	242 (4.4)	*** (**.*)	*** (**.*)	*** (**.*)	205 (2.9)	246 (2.0)	249 (2.0)
Don't know									
State	30 (2.6)	19 (4.7)	13 (3.5)	10 (1.2)	9 (3.0)	11 (3.2)	60 (2.8)	72 (5.4)	77 (3.9)
	216 (2.8)	*** (**.*)	*** (**.*)	218 (3.6)	*** (**.*)	*** (**.*)	215 (1.9)	247 (5.2)	256 (3.9)
Nation	33 (1.5)	16 (3.0)	16 (2.1)	9 (0.9)	11 (2.9)	9 (1.4)	59 (1.6)	73 (3.2)	75 (2.6)
	210 (1.8)	*** (**.*)	237 (4.1)	221 (3.4)	*** (**.*)	*** (**.*)	212 (1.1)	242 (3.3)	253 (2.2)
GENDER									
Male									
State	30 (2.2)	13 (1.5)	14 (1.4)	12 (1.1)	14 (1.8)	12 (1.3)	57 (2.4)	74 (2.4)	75 (1.9)
	221 (2.5)	255 (4.3)	263 (3.6)	232 (2.4)	272 (3.0)	273 (3.5)	225 (1.8)	272 (2.0)	275 (1.6)
Nation	34 (1.4)	17 (1.5)	18 (1.3)	10 (0.8)	16 (1.6)	13 (1.1)	56 (1.6)	67 (2.0)	69 (1.6)
	215 (1.5)	247 (3.3)	254 (2.3)	230 (2.3)	266 (3.6)	269 (2.4)	220 (1.2)	266 (1.8)	269 (1.2)
Female									
State	31 (2.5)	9 (1.2)	10 (1.1)	12 (1.0)	15 (2.0)	12 (1.7)	57 (2.5)	76 (2.3)	78 (1.9)
	222 (2.4)	259 (4.2)	260 (3.9)	228 (3.4)	267 (2.9)	271 (3.8)	222 (1.8)	264 (2.1)	269 (1.7)
Nation	32 (1.3)	14 (1.3)	12 (0.9)	9 (0.7)	12 (1.4)	11 (0.8)	59 (1.6)	74 (1.7)	77 (1.3)
	214 (1.3)	249 (3.3)	254 (2.4)	224 (2.7)	271 (3.6)	271 (3.0)	217 (1.4)	262 (1.5)	268 (1.3) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

TABLE A28 | Students' Knowledge of Using Calculators

THE NATION'S REPORT CARD naep
1992
Trial State Assessment

	High		Other	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		**Percentage of Students and Average Math Proficiency**	
TOTAL				
State	25 (1.4)	27 (1.5)	75 (1.4)	73 (1.5)
	223 (1.8)	283 (2.1)	223 (1.6)	265 (1.8)
Nation	23 (0.9)	26 (0.9)	77 (0.9)	74 (0.9)
	217 (1.7)	280 (1.6)	217 (1.0)	260 (1.1)
RACE/ ETHNICITY				
White				
State	27 (1.7)	29 (1.6)	73 (1.7)	71 (1.6)
	229 (1.8)	286 (1.9)	230 (1.4)	271 (1.5)
Nation	23 (1.0)	30 (1.2)	77 (1.0)	70 (1.2)
	227 (1.9)	287 (1.4)	226 (1.2)	271 (1.5)
Black				
State	23 (2.1)	15 (2.5)	77 (2.1)	85 (2.5)
	*** (**.*)	*** (**.*)	193 (2.9)	237 (5.3)
Nation	25 (2.3)	15 (1.7)	75 (2.3)	85 (1.7)
	189 (3.0)	238 (4.7)	191 (1.7)	233 (1.9)
Hispanic				
State	22 (3.3)	18 (4.6)!	78 (3.3)	82 (4.6)!
	*** (**.*)	*** (**.*)	204 (3.2)	*** (**.*)
Nation	24 (1.8)	18 (1.7)	76 (1.8)	82 (1.7)
	199 (3.3)	251 (4.0)	198 (1.9)	241 (1.9)
TYPE OF COMMUNITY				
Adv. urban				
State	17 (6.0)!	41 (5.2)!	83 (6.0)!	59 (5.2)!
	*** (**.*)	*** (**.*)	236 (5.1)!	*** (**.*)
Nation	19 (2.2)!	30 (3.3)!	81 (2.2)!	70 (3.3)!
	*** (**.*)	*** (**.*)	237 (3.8)!	280 (5.3)!
Disadv. urban				
State	27 (2.4)	16 (3.0)!	73 (2.4)	84 (3.0)!
	195 (5.2)!	*** (**.*)	196 (3.9)	243 (5.7)!
Nation	22 (1.7)	18 (2.1)	78 (1.7)	82 (2.1)
	191 (3.5)	251 (5.9)!	195 (3.1)	235 (3.1)
Extreme rural				
State	25 (1.9)!	33 (4.7)!	75 (1.9)!	67 (4.7)!
	*** (**.*)	*** (**.*)	228 (1.8)!	274 (5.6)!
Nation	29 (2.9)	26 (3.5)!	71 (2.9)	74 (3.5)!
	216 (5.4)!	282 (4.7)!	217 (4.0)	262 (4.9)!
Other				
State	28 (1.6)	28 (1.9)	72 (1.6)	72 (1.9)
	227 (2.3)	284 (2.3)	227 (2.0)	269 (1.8)
Nation	23 (1.0)	27 (1.2)	77 (1.0)	73 (1.2)
	218 (1.7)	282 (1.6)	218 (1.2)	262 (1.5)

(continued on next page)

TABLE A28 | Students' Knowledge of Using Calculators
(continued)

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	High		Other	
	1992 Grade 4	1992 Grade 8	1992 Grade 4	1992 Grade 8
	Percentage of Students and Average Math Proficiency		**Percentage of Students and Average Math Proficiency**	
TOTAL				
State	25 (1.4)	27 (1.5)	75 (1.4)	73 (1.5)
	223 (1.8)	283 (2.1)	223 (1.6)	265 (1.8)
Nation	23 (0.9)	26 (0.9)	77 (0.9)	74 (0.9)
	217 (1.7)	280 (1.6)	217 (1.0)	260 (1.1)
PARENTS' EDUCATION				
College grad				
State	23 (1.8)	29 (2.0)	77 (1.8)	71 (2.0)
	230 (3.3)	294 (2.9)	229 (2.3)	278 (2.1)
Nation	21 (1.4)	30 (1.6)	79 (1.4)	70 (1.6)
	223 (2.4)	291 (2.3)	225 (1.5)	273 (1.7)
Some college				
State	19 (3.4)	26 (3.0)	81 (3.4)	74 (3.0)
	*** (**.*)	278 (3.3)	238 (3.4)	268 (2.6)
Nation	23 (2.8)	26 (1.9)	77 (2.8)	74 (1.9)
	*** (**.*)	283 (2.9)	224 (2.9)	263 (2.0)
HS graduate				
State	25 (2.4)	27 (2.3)	75 (2.4)	73 (2.3)
	222 (2.9)	278 (3.6)	218 (2.3)	256 (2.1)
Nation	22 (2.7)	21 (1.5)	78 (2.7)	79 (1.5)
	213 (4.0)	267 (3.0)	211 (2.1)	252 (2.0)
HS non-grad				
State	41 (7.1)	22 (3.8)	59 (7.1)	78 (3.8)
	*** (**.*)	*** (**.*)	*** (**.*)	249 (4.6)
Nation	31 (4.6)	24 (2.7)	69 (4.6)	76 (2.7)
	*** (**.*)	*** (**.*)	199 (3.8)	242 (2.3)
Don't know				
State	28 (2.4)	19 (4.9)	72 (2.4)	81 (4.9)
	216 (2.5)	*** (**.*)	215 (2.1)	246 (5.3)
Nation	26 (1.5)	20 (2.4)	74 (1.5)	80 (2.4)
	214 (2.3)	264 (4.3)	211 (1.3)	248 (2.6)
GENDER				
Male				
State	22 (1.5)	22 (1.8)	78 (1.5)	78 (1.8)
	222 (2.8)	287 (3.2)	224 (1.9)	268 (2.1)
Nation	21 (1.2)	23 (1.4)	79 (1.2)	77 (1.4)
	218 (2.5)	279 (2.4)	218 (1.4)	261 (1.4)
Female				
State	29 (1.9)	32 (2.1)	71 (1.9)	68 (2.1)
	223 (2.2)	279 (2.5)	222 (2.1)	262 (2.1)
Nation	26 (1.0)	29 (1.1)	74 (1.0)	71 (1.1)
	216 (1.9)	281 (1.9)	216 (1.2)	260 (1.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). Comparisons to 1990 are not appropriate because of the changing nature of the calculator-suitable and calculator-unsuitable items and the changing nature of the definitions of the "High" and "Other" groups from 1990 to 1992. Students in the "High" group used the calculator for at least 65 percent of the calculator-suitable items and used the calculator for no more than one of the calculator-unsuitable items. Students in the "Other" group used the calculator for less than 65 percent of the calculator-suitable items or used it for more than one of the calculator-unsuitable items. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A32 | Students' Reports on Types of Reading Materials in the Home

	Zero to Two Types			Three Types			Four Types		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**			**Percentage of Students and Average Math Proficiency**		
TOTAL									
State	26 (1.1)	14 (0.7)	15 (1.0)	35 (0.8)	30 (1.2)	29 (0.8)	38 (1.3)	56 (1.4)	56 (1.2)
	213 (1.5)	248 (2.6)	252 (2.0)	223 (1.8)	262 (1.9)	266 (1.9)	230 (1.7)	274 (1.6)	278 (1.6)
Nation	31 (1.3)	21 (1.0)	21 (0.7)	35 (0.7)	30 (1.0)	31 (0.7)	34 (1.2)	48 (1.3)	48 (1.0)
	206 (1.1)	244 (2.1)	247 (1.2)	218 (1.0)	259 (1.6)	266 (1.3) >	227 (1.2)	272 (1.5)	275 (1.1)
RACE/ ETHNICITY									
White									
State	23 (1.1)	12 (0.7)	12 (1.0)	37 (1.0)	29 (1.4)	28 (0.9)	41 (1.4)	59 (1.4)	60 (1.2)
	222 (1.7)	257 (2.6)	259 (2.3)	229 (1.7)	267 (1.4)	272 (1.6)	236 (1.4)	278 (1.3)	281 (1.3)
Nation	26 (1.5)	16 (1.1)	14 (0.7)	36 (0.8)	29 (1.3)	30 (0.9)	38 (1.4)	56 (1.5)	56 (1.1)
	216 (1.5)	250 (2.7)	260 (1.7) >	226 (1.2)	268 (1.5)	275 (1.5) >	233 (1.2)	277 (1.7)	281 (1.2)
Black									
State	37 (4.0)	23 (3.2)	26 (2.7)	30 (1.8)	34 (3.2)	36 (3.4)	33 (3.7)	42 (3.6)	37 (3.8)
	189 (3.1)	*** (**.*)	236 (4.4)	194 (3.5)	239 (3.5)!	233 (4.1)	195 (4.1)	246 (3.3)	242 (7.7)!
Nation	41 (2.3)	31 (1.9)	31 (1.9)	36 (1.9)	36 (2.2)	38 (1.5)	23 (1.3)	33 (2.4)	31 (1.9)
	187 (2.0)	234 (3.0)	228 (2.4)	192 (2.1)	233 (4.3)	238 (1.8)	195 (2.2)	246 (2.9)	242 (2.5)
Hispanic									
State	43 (3.7)	32 (4.6)	39 (8.7)!	35 (2.6)	27 (3.4)	20 (5.4)!	22 (3.8)	40 (4.1)	42 (6.0)!
	199 (2.8)	*** (**.*)	*** (**.*)	201 (4.5)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	49 (2.4)	44 (3.0)	45 (1.9)	28 (1.7)	30 (2.4)	28 (1.5)	23 (2.2)	26 (2.3)	27 (1.8)
	193 (1.6)	235 (3.5)	238 (1.5)	202 (2.7)	246 (4.6)	250 (2.4)	211 (2.8)	253 (3.7)	252 (3.2)
TYPE OF COMMUNITY									
Adv urban									
State	18 (2.4)!	8 (1.2)!	1 (1.4)! <	35 (1.8)!	21 (2.7)!	25 (3.7)!	48 (3.9)!	71 (3.0)!	74 (3.9)!
	*** (**.*)	*** (**.*)	*** (**.*)	240 (5.6)!	285 (3.5)!	*** (**.*)	241 (4.8)!	291 (3.0)	*** (**.*)
Nation	11 (1.7)!	13 (3.8)!	12 (1.9)!	33 (2.6)!	26 (2.1)!	27 (2.4)!	55 (3.8)!	61 (4.9)!	61 (3.2)!
	*** (**.*)	*** (**.*)	*** (**.*)	238 (3.3)!	*** (**.*)	286 (6.1)!	244 (3.7)!	288 (3.7)!	288 (4.1)!
Disadv urban									
State	45 (3.4)	25 (2.0)!	28 (2.5)!	33 (2.3)	35 (2.1)!	32 (1.8)!	21 (2.7)	40 (2.7)!	40 (2.3)!
	194 (2.9)	230 (5.0)!	241 (4.4)!	197 (4.7)!	244 (5.7)!	242 (4.6)!	198 (6.0)!	256 (7.2)!	250 (7.6)!
Nation	49 (3.1)	32 (3.9)!	36 (2.4)	31 (2.4)	31 (2.3)!	35 (1.3)	20 (1.9)	37 (3.6)!	28 (2.1)
	190 (2.4)	243 (3.1)!	232 (3.3)	195 (4.7)	248 (3.3)!	244 (3.2)	199 (3.2)	258 (5.7)!	242 (3.8)
Extreme rural									
State	19 (2.7)!	16 (2.7)!	13 (2.7)!	36 (2.1)!	29 (4.2)!	31 (3.0)!	45 (3.2)!	55 (3.1)!	55 (3.4)!
	*** (**.*)	*** (**.*)	*** (**.*)	227 (2.5)!	*** (**.*)	274 (5.3)!	238 (1.7)!	274 (2.6)!	282 (5.2)!
Nation	34 (2.6)	17 (4.9)!	20 (3.2)!	32 (1.2)	33 (3.2)!	28 (2.7)!	33 (2.6)	50 (5.1)!	53 (4.7)!
	210 (5.3)!	*** (**.*)	249 (5.6)!	216 (3.4)	254 (5.2)!	265 (5.2)!	222 (3.1)	263 (5.4)!	275 (4.1)!
Other									
State	25 (1.3)	13 (0.9)	13 (1.1)	36 (1.5)	30 (1.7)	27 (1.1)	39 (1.7)	56 (1.8)	61 (1.4)
	221 (1.9)	253 (3.0)	254 (2.5)	226 (1.7)	263 (1.7)	272 (1.9) >	230 (2.0)	273 (1.8)	281 (1.4) >
Nation	31 (1.6)	22 (1.5)	20 (0.8)	36 (1.0)	30 (1.3)	32 (0.9)	33 (1.3)	48 (1.5)	48 (1.1)
	208 (1.2)	243 (2.4)	249 (1.5)	220 (1.5)	259 (2.2)	267 (1.5) >	227 (1.3)	272 (1.6)	276 (1.3)

(continued on next page)

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TABLE A32 (continued)

Students' Reports on Types of Reading Materials in the Home

	Zero to Two Types			Three Types			Four Types		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**			**Percentage of Students and Average Math Proficiency**		
TOTAL									
State	26 (1.1)	14 (0.7)	15 (1.0)	35 (0.8)	30 (1.2)	29 (0.8)	38 (1.3)	56 (1.4)	56 (1.2)
	213 (1.5)	248 (2.6)	252 (2.0)	223 (1.8)	262 (1.9)	266 (1.9)	230 (1.7)	274 (1.6)	278 (1.6)
Nation	31 (1.3)	21 (1.0)	21 (0.7)	35 (0.7)	30 (1.0)	31 (0.7)	34 (1.2)	48 (1.3)	48 (1.0)
	206 (1.1)	244 (2.1)	247 (1.2)	218 (1.0)	259 (1.6)	266 (1.3) >	227 (1.2)	272 (1.5)	275 (1.1)
PARENTS' EDUCATION									
College grad									
State	16 (1.2)	6 (0.8)	6 (0.8)	34 (1.4)	25 (1.8)	24 (1.3)	50 (1.7)	69 (1.9)	69 (1.5)
	217 (3.4)	*** (**.*)	261 (3.7)	229 (2.7)	274 (3.1)	278 (2.6)	235 (2.2)	285 (1.9)	285 (1.7)
Nation	20 (1.2)	10 (0.8)	12 (0.7)	36 (1.2)	28 (1.8)	27 (1.2)	44 (1.6)	62 (2.0)	61 (1.5)
	210 (2.0)	254 (3.3)	259 (3.1)	222 (1.5)	270 (2.4)	277 (2.1)	233 (1.5)	280 (1.7)	283 (1.5)
Some college									
State	17 (2.4)	10 (1.3)	13 (1.8)	36 (3.3)	29 (2.1)	30 (1.7)	46 (3.4)	61 (2.6)	57 (2.0)
	*** (**.*)	*** (**.*)	257 (4.6)	234 (3.1)	268 (2.5)	271 (3.4)	240 (3.0)	274 (1.7)	279 (2.1)
Nation	27 (2.5)	17 (1.5)	16 (1.2)	37 (2.5)	32 (1.7)	34 (1.6)	36 (2.4)	51 (2.0)	50 (1.8)
	218 (3.3)	251 (4.8)	254 (2.6)	225 (3.4)	262 (2.9)	269 (2.0)	223 (2.9)	275 (2.1)	276 (1.7)
HS graduate									
State	32 (2.6)	19 (1.3)	20 (1.4)	36 (2.1)	35 (1.8)	31 (1.4)	32 (2.1)	46 (1.7)	49 (1.5)
	215 (3.2)	246 (3.4)	252 (3.1)	220 (2.6)	255 (2.3)	258 (1.8)	226 (2.2)	261 (2.0)	269 (2.4)
Nation	34 (3.0)	26 (2.2)	25 (1.4)	38 (2.8)	33 (1.9)	35 (1.6)	28 (2.1)	40 (1.7)	41 (1.6)
	206 (3.0)	246 (2.1)	243 (2.1)	212 (2.2)	253 (3.5)	258 (2.3)	221 (3.2)	262 (2.0)	262 (1.8)
HS non-grad									
State	45 (5.6)	35 (4.5)	39 (4.0)	29 (4.9)	33 (4.0)	31 (3.5)	26 (4.2)	33 (3.4)	30 (3.4)
	*** (**.*)	*** (**.*)	244 (3.6)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	53 (3.5)	47 (4.0)	44 (3.1)	25 (3.1)	28 (3.0)	32 (2.0)	22 (3.4)	25 (2.8)	25 (2.8)
	200 (3.1)	239 (2.9)	241 (2.5)	204 (4.1)	244 (3.4)	251 (2.8)	*** (**.*)	243 (3.9)	257 (4.0)
Don't know									
State	35 (1.6)	34 (4.7)	29 (4.9)	37 (1.5)	31 (5.7)	39 (5.3)	28 (1.6)	35 (4.6)	32 (4.5)
	209 (2.1)	*** (**.*)	*** (**.*)	217 (2.7)	*** (**.*)	*** (**.*)	222 (2.3)	*** (**.*)	*** (**.*)
Nation	41 (1.6)	38 (2.9)	39 (2.5)	34 (1.2)	32 (3.2)	33 (2.1)	25 (1.2)	30 (3.4)	28 (2.3)
	203 (1.3)	228 (5.2)	241 (2.2)	216 (1.5)	240 (4.7)	256 (3.2)	222 (1.6)	256 (5.0)	260 (3.7)
GENDER									
Male									
State	25 (1.3)	13 (1.1)	14 (1.3)	37 (1.5)	30 (1.4)	27 (1.2)	38 (1.7)	57 (1.6)	59 (1.6)
	215 (1.9)	250 (3.5)	254 (3.0)	224 (2.0)	263 (2.1)	269 (2.2)	231 (2.2)	277 (1.9)	280 (1.5)
Nation	31 (1.4)	21 (1.5)	22 (0.8)	35 (1.1)	31 (1.5)	31 (0.9)	34 (1.3)	48 (1.4)	48 (1.2)
	206 (1.2)	243 (2.4)	248 (1.8)	220 (1.4)	260 (2.0)	266 (1.6) >	229 (1.5)	274 (1.9)	274 (1.5)
Female									
State	28 (1.7)	16 (1.0)	15 (1.3)	34 (1.4)	30 (1.8)	31 (1.3)	39 (1.7)	54 (1.8)	54 (1.9)
	212 (1.9)	246 (2.9)	250 (2.4)	223 (2.3)	261 (2.4)	264 (2.4)	230 (1.9)	270 (1.9)	276 (2.0)
Nation	32 (1.6)	22 (1.2)	20 (1.0)	35 (0.9)	29 (1.4)	32 (1.2)	33 (1.5)	49 (1.9)	48 (1.3)
	207 (1.6)	245 (2.5)	246 (1.8)	217 (1.3)	258 (2.1)	265 (1.5) >	225 (1.5)	270 (1.8)	276 (1.3) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A33 | Students' Reports on the Amount of Time Spent Watching Television Each Day

	One Hour or Less			Two Hours			Three Hours		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	19 (1.0)	14 (0.7)	16 (0.9)	22 (1.0)	24 (1.1)	28 (1.1)	20 (1.0)	26 (1.1)	26 (0.9)
	225 (2.4)	276 (2.4)	280 (2.5)	230 (1.5)	272 (1.8)	277 (1.5)	227 (1.8)	269 (1.7)	273 (1.5)
Nation	21 (0.8)	12 (0.8)	15 (0.6) >	19 (0.7)	21 (0.9)	23 (0.6)	17 (0.6)	22 (0.8)	22 (0.6)
	220 (1.6)	269 (2.4)	276 (2.2)	224 (1.5)	268 (1.9)	276 (1.6) >	223 (1.4)	266 (1.8)	270 (1.2)
RACE/ ETHNICITY									
White									
State	21 (1.1)	14 (0.7)	17 (1.0)	24 (1.1)	26 (1.1)	29 (1.2)	21 (1.2)	28 (1.2)	27 (1.0)
	230 (2.4)	280 (2.1)	284 (2.0)	234 (1.5)	277 (1.6)	280 (1.4)	232 (1.6)	273 (1.4)	276 (1.7)
Nation	23 (1.1)	13 (1.0)	17 (0.6) >	21 (0.9)	23 (1.2)	27 (0.8) >	18 (0.8)	24 (1.1)	23 (0.8)
	227 (1.8)	277 (2.6)	282 (2.2)	230 (1.6)	274 (2.2)	282 (1.7)	229 (1.7)	272 (2.0)	277 (1.3)
Black									
State	11 (1.6)	8 (1.5)	7 (1.7)	12 (1.9)	12 (2.4)	16 (2.9)	14 (1.7)	15 (1.4)	19 (2.4)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	14 (1.1)	6 (0.8)	7 (1.2)	10 (1.0)	13 (1.7)	10 (1.1)	12 (1.4)	17 (2.1)	17 (1.7)
	185 (2.5)	*** (**.*)	238 (5.5)	191 (2.7)	236 (7.2)	238 (3.8)	194 (3.8)	240 (5.6)	244 (3.6)
Hispanic									
State	20 (2.9)	8 (2.9)	15 (4.2)!	17 (2.6)	24 (4.5)	25 (5.1)!	16 (2.2)	26 (4.8)	18 (3.5)!
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	19 (1.7)	14 (2.4)	13 (1.2)	16 (1.4)	20 (2.5)	20 (1.5)	15 (1.2)	19 (2.1)	23 (1.7)
	198 (2.9)	*** (**.*)	245 (4.0)	207 (3.5)	243 (3.5)	250 (2.8)	208 (2.3)	242 (6.3)	253 (2.2)
TYPE OF COMMUNITY									
Adv. urban									
State	25 (4.0)!	20 (2.1)!	33 (14.3)!	29 (3.6)!	28 (2.7)!	30 (6.5)!	12 (2.9)!	27 (3.1)!	20 (6.8)!
	241 (5.2)!	301 (2.6)!	*** (**.*)	242 (4.7)!	289 (3.8)!	*** (**.*)	*** (**.*)	290 (3.7)!	*** (**.*)
Nation	30 (3.3)!	18 (1.4)!	28 (2.7)! >	31 (2.4)!	25 (4.3)!	24 (1.3)!	15 (1.9)!	21 (1.8)!	26 (2.4)!
	243 (3.1)!	*** (**.*)	291 (5.4)!	243 (4.5)!	*** (**.*)	291 (6.8)!	*** (**.*)	*** (**.*)	282 (4.0)!
Disadv. urban									
State	13 (1.6)	10 (1.9)!	11 (2.0)!	12 (1.6)	16 (3.1)!	15 (2.3)!	14 (1.9)	23 (2.0)!	25 (2.6)!
	186 (4.2)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	203 (6.6)!	248 (7.0)!	251 (4.2)!
Nation	15 (1.3)	9 (1.2)!	8 (1.5)	13 (1.4)	17 (3.1)!	14 (1.1)	13 (1.1)	19 (2.1)!	19 (2.1)
	191 (4.4)	*** (**.*)	241 (6.6)!	196 (3.8)!	249 (3.5)!	241 (4.5)!	199 (4.8)!	256 (5.6)!	245 (4.7)
Extreme rural									
State	19 (3.8)!	17 (2.4)!	19 (1.7)!	20 (2.6)!	26 (4.2)!	25 (3.2)!	27 (3.6)!	30 (5.2)!	25 (2.7)!
	*** (**.*)	*** (**.*)	*** (**.*)	229 (3.3)!	*** (**.*)	280 (5.2)!	234 (3.2)!	*** (**.*)	281 (3.5)!
Nation	20 (1.9)	14 (3.3)!	14 (2.2)!	17 (1.6)	19 (2.6)!	21 (2.7)!	20 (1.9)	23 (2.0)!	24 (1.9)!
	213 (4.4)!	*** (**.*)	279 (6.0)!	220 (5.8)	*** (**.*)	277 (4.9)!	222 (3.5)!	*** (**.*)	269 (4.7)!
Other									
State	19 (1.1)	13 (0.9)	16 (1.1)	23 (1.5)	25 (1.3)	31 (1.4)	21 (1.3)	27 (1.5)	26 (1.2)
	225 (2.3)	273 (2.8)	281 (2.3)	231 (1.9)	272 (2.0)	280 (1.6) >	229 (2.1)	269 (1.6)	275 (1.8)
Nation	21 (1.1)	12 (1.0)	15 (0.6)	18 (0.8)	21 (1.0)	25 (0.9)	17 (0.7)	23 (1.2)	22 (0.7)
	220 (2.0)	268 (2.9)	275 (2.3)	224 (1.4)	269 (2.3)	277 (1.7)	224 (1.8)	266 (2.3)	272 (1.4)

(continued on next page)

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TABLE A33 (continued)

Students' Reports on the Amount of Time Spent Watching Television Each Day

	One Hour or Less			Two Hours			Three Hours		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	19 (1.0) 225 (2.4)	14 (0.7) 276 (2.4)	16 (0.9) 280 (2.5)	22 (1.0) 230 (1.5)	24 (1.1) 272 (1.8)	28 (1.1) 277 (1.5)	20 (1.0) 227 (1.8)	26 (1.1) 269 (1.7)	26 (0.9) 273 (1.5)
Nation	21 (0.8) 220 (1.6)	12 (0.8) 269 (2.4)	15 (0.6) > 276 (2.2)	19 (0.7) 224 (1.5)	21 (0.9) 268 (1.9)	23 (0.6) 276 (1.6) >	17 (0.6) 223 (1.4)	22 (0.8) 266 (1.8)	22 (0.6) 270 (1.2)
PARENTS' EDUCATION									
College grad.									
State	23 (1.9) 236 (2.7)	19 (1.3) 288 (3.4)	21 (1.7) 290 (2.8)	24 (1.5) 235 (2.4)	27 (1.6) 286 (2.6)	31 (1.7) 288 (2.3)	19 (1.5) 233 (2.7)	27 (1.9) 283 (2.6)	25 (1.4) 282 (2.3)
Nation	26 (1.3) 229 (2.2)	17 (1.3) 283 (2.9)	19 (1.1) 289 (2.4)	21 (1.1) 233 (1.9)	22 (1.6) 280 (2.6)	27 (1.0) 285 (2.3)	16 (0.8) 229 (2.1)	23 (1.1) 277 (2.3)	23 (1.1) 283 (1.7)
Some college									
State	18 (2.1) *** (**.*)	12 (1.3) 281 (3.8)	15 (1.5) 281 (4.6)	22 (2.7) *** (**.*)	27 (2.3) 276 (2.4)	30 (2.7) 276 (2.8)	26 (3.2) 240 (4.1)	30 (1.8) 272 (3.1)	26 (2.5) 273 (2.8)
Nation	17 (1.8) 222 (3.7)	10 (1.4) *** (**.*)	16 (1.1) > 273 (3.5)	16 (1.7) 228 (4.4)	25 (2.4) 275 (3.2)	24 (1.5) 278 (2.3)	19 (2.2) 235 (3.8)	23 (2.6) 269 (3.4)	22 (1.4) 273 (2.6)
HS graduate									
State	14 (1.9) 220 (4.5)	10 (1.2) 264 (3.7)	12 (1.0) 263 (3.6)	21 (1.8) 225 (2.6)	22 (1.7) 260 (2.9)	25 (1.5) 269 (2.5)	21 (2.5) 222 (3.0)	27 (1.6) 258 (2.0)	28 (1.6) 268 (2.3)
Nation	15 (1.3) 210 (3.7)	8 (1.0) 248 (5.5)	12 (1.1) 259 (3.5)	17 (1.8) 215 (3.5)	17 (1.4) 256 (3.4)	21 (1.0) 265 (2.6)	19 (1.8) 222 (3.7)	23 (2.0) 260 (3.6)	22 (1.2) 261 (1.9)
HS non-grad.									
State	25 (3.8) *** (**.*)	9 (2.5) *** (**.*)	11 (2.4) *** (**.*)	17 (3.5) *** (**.*)	19 (4.0) *** (**.*)	25 (3.2) *** (**.*)	20 (3.3) *** (**.*)	24 (4.4) *** (**.*)	20 (2.7) *** (**.*)
Nation	18 (3.5) *** (**.*)	12 (2.2) *** (**.*)	12 (1.6) *** (**.*)	11 (2.2) *** (**.*)	20 (3.1) *** (**.*)	17 (1.5) 264 (5.3)	21 (4.4) *** (**.*)	21 (2.8) *** (**.*)	22 (1.7) 247 (2.8)
Don't know									
State	18 (1.4) 212 (4.0)	13 (2.8) *** (**.*)	12 (2.8) *** (**.*)	21 (1.3) 225 (2.4)	19 (3.8) *** (**.*)	16 (2.9) *** (**.*)	18 (1.5) 219 (2.7)	17 (3.5) *** (**.*)	20 (3.6) *** (**.*)
Nation	19 (1.0) 212 (2.0)	8 (1.5) *** (**.*)	9 (1.3) *** (**.*)	18 (0.9) 217 (2.1)	18 (1.9) *** (**.*)	17 (2.1) 258 (3.7)	18 (1.1) 217 (2.0)	17 (2.1) *** (**.*)	21 (1.8) 258 (3.5)
GENDER									
Male									
State	16 (1.1) 225 (2.5)	13 (1.1) 278 (3.2)	14 (1.1) 283 (3.4)	20 (1.1) 230 (2.1)	24 (1.3) 274 (2.8)	29 (1.6) > 279 (1.8)	19 (1.2) 230 (2.3)	27 (1.4) 273 (2.3)	26 (1.3) 275 (1.9)
Nation	18 (0.9) 221 (2.1)	11 (0.9) 268 (3.7)	14 (0.9) 274 (2.8)	17 (1.0) 226 (1.9)	22 (1.2) 266 (2.5)	22 (0.7) 274 (1.9) >	17 (0.9) 225 (1.8)	22 (1.0) 267 (2.3)	23 (0.9) 272 (1.7)
Female									
State	23 (1.5) 225 (3.0)	14 (1.0) 275 (3.3)	18 (1.3) 277 (3.0)	23 (1.5) 230 (1.9)	25 (1.3) 271 (2.1)	26 (1.3) 276 (2.1)	20 (1.3) 224 (2.3)	26 (1.3) 265 (2.3)	26 (1.1) 271 (2.1)
Nation	24 (1.0) 219 (1.9)	14 (1.1) 269 (3.3)	17 (0.7) 277 (2.3)	20 (0.7) 223 (1.9)	20 (1.3) 269 (2.4)	24 (1.0) > 278 (1.9) >	16 (0.8) 221 (2.0)	23 (1.4) 265 (2.2)	22 (0.7) 269 (1.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A33
(continued)

Students' Reports on the Amount of Time Spent Watching Television Each Day

	Four to Five Hours			Six Hours or More		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			**Percentage of Students and Average Math Proficiency**		
TOTAL						
State	21 (0.9)	25 (1.0)	22 (0.9) <	18 (1.3)	10 (0.8)	9 (0.8)
	226 (2.0)	262 (1.9)	264 (1.9)	206 (1.8)	244 (3.1)	246 (3.4)
Nation	22 (0.8)	28 (1.1)	26 (0.7)	22 (0.8)	16 (1.0)	13 (0.4)
	219 (1.3)	262 (1.6)	260 (1.1)	203 (1.2)	245 (2.0)	243 (1.5)
RACE/ ETHNICITY						
White						
State	21 (1.0)	24 (1.2)	21 (1.0)	13 (1.1)	7 (0.8)	6 (0.7)
	233 (1.6)	266 (2.1)	270 (1.8)	216 (1.6)	255 (3.1)	257 (3.9)
Nation	22 (1.0)	27 (1.4)	24 (0.8)	16 (0.9)	12 (1.2)	8 (0.3) <
	226 (1.4)	268 (1.7)	269 (1.3)	215 (1.6)	253 (3.0)	261 (2.3)
Black						
State	21 (2.4)	36 (2.8)	29 (2.9)	43 (3.0)	29 (2.4)	29 (3.8)
	194 (4.8)	245 (3.6)!	240 (4.8)	191 (2.1)	235 (4.7)	228 (5.0)!
Nation	19 (1.5)	32 (1.8)	33 (1.5)	45 (2.1)	32 (2.2)	33 (1.6)
	196 (2.5)	244 (3.9)	240 (1.9)	189 (2.0)	233 (3.4)	227 (2.3)
Hispanic						
State	18 (3.2)	21 (4.2)	25 (4.3)!	29 (3.9)	21 (5.9)	17 (4.5)!
	*** (**.*)	*** (**.*)	*** (**.*)	199 (3.6)	*** (**.*)	*** (**.*)
Nation	21 (1.2)	31 (3.1)	27 (1.6)	30 (1.7)	17 (1.7)	18 (1.3)
	201 (2.9)	247 (3.9)	247 (2.6)	190 (1.8)	236 (5.3)	224 (2.6)
TYPE OF COMMUNITY						
Adv. urban						
State	23 (3.5)!	20 (1.9)!	13 (5.9)!	11 (3.5)!	5 (1.0)!	4 (3.5)!
	238 (3.0)!	276 (2.7)!	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	14 (2.6)!	30 (4.3)!	17 (2.3)!	10 (2.5)!	6 (2.0)!	5 (1.5)!
	*** (**.*)	*** (**.*)	281 (6.4)!	*** (**.*)	*** (**.*)	*** (**.*)
Disadv. urban						
State	22 (2.3)	31 (2.3)!	26 (2.1)!	39 (4.2)	20 (2.6)!	24 (4.2)!
	199 (6.6)!	250 (4.3)!	242 (3.5)!	191 (2.2)	*** (**.*)	228 (5.6)!
Nation	21 (1.9)	34 (2.4)!	32 (1.5)	39 (2.9)	20 (3.2)!	26 (1.9)
	200 (3.7)	253 (4.8)!	243 (2.8)	187 (3.1)	238 (6.0)!	227 (3.4)
Extreme rural						
State	20 (2.5)!	21 (4.7)!	21 (3.0)!	14 (4.4)!	7 (1.2)!	10 (2.3)!
	235 (2.3)!	*** (**.*)	268 (5.2)!	*** (**.*)	*** (**.*)	*** (**.*)
Nation	25 (2.3)	26 (2.7)!	30 (2.1)!	18 (2.6)	19 (3.8)!	11 (2.2)!
	222 (3.2)	257 (4.1)!	261 (4.0)!	201 (4.5)!	*** (**.*)	243 (9.2)!
Other						
State	22 (1.4)	25 (1.4)	21 (1.1)	14 (1.6)	9 (1.2)	6 (0.6)
	228 (2.2)	264 (2.6)	270 (2.3)	214 (1.9)	250 (3.7)	254 (3.9)
Nation	22 (0.9)	27 (1.2)	25 (0.8)	22 (1.0)	17 (1.4)	13 (0.6)
	221 (1.7)	260 (2.1)	262 (1.3)	205 (1.4)	245 (2.8)	246 (2.1)

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TABLE A33
(continued)

Students' Reports on the Amount of Time Spent Watching Television Each Day

	Four to Five Hours			Six Hours or More		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL						
State	21 (0.9)	25 (1.0)	22 (0.9) <	18 (1.3)	10 (0.8)	9 (0.8)
	226 (2.0)	262 (1.9)	264 (1.9)	206 (1.8)	244 (3.1)	246 (3.4)
Nation	22 (0.8)	28 (1.1)	26 (0.7)	22 (0.8)	16 (1.0)	13 (0.4)
	219 (1.3)	262 (1.6)	260 (1.1)	203 (1.2)	245 (2.0)	243 (1.5)
PARENTS' EDUCATION						
College grad						
State	20 (1.8)	21 (1.5)	18 (1.2)	14 (1.6)	7 (0.9)	5 (0.8)
	229 (3.3)	274 (3.3)	269 (3.7)	208 (3.3)	*** (**.*)	*** (**.*)
Nation	20 (1.1)	25 (1.5)	21 (0.9)	18 (1.2)	12 (1.1)	10 (0.6)
	225 (2.2)	271 (2.4)	271 (2.1)	206 (2.1)	253 (3.0)	248 (3.0)
Some college						
State	24 (2.5)	21 (2.1)	20 (2.0)	10 (2.2)	11 (1.2)	9 (1.7)
	*** (**.*)	265 (2.6)	273 (3.8)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	25 (2.0)	28 (2.2)	27 (1.3)	23 (2.0)	14 (1.5)	12 (1.0)
	221 (3.5)	270 (2.9)	266 (2.0)	210 (4.0)	243 (3.7)	251 (3.7)
HS graduate						
State	26 (2.4)	29 (1.5)	24 (1.1)	18 (2.0)	12 (1.4)	11 (1.4)
	224 (2.7)	255 (2.8)	260 (2.3)	208 (3.5)	241 (3.3)	240 (5.1)
Nation	24 (2.6)	32 (2.3)	29 (1.3)	26 (2.1)	19 (1.6)	16 (1.3)
	218 (3.2)	254 (2.5)	254 (2.3)	200 (3.3)	251 (3.9)	238 (2.6)
HS non-grad.						
State	18 (3.2)	38 (4.6)	25 (3.0)	21 (4.2)	11 (2.8)	18 (3.7)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	21 (2.2)	28 (2.9)	31 (1.7)	29 (4.0)	20 (2.4)	18 (1.7)
	*** (**.*)	245 (3.5)	245 (2.2)	195 (4.3)	*** (**.*)	235 (5.4)
Don't know						
State	20 (1.3)	28 (4.1)	34 (5.2)	23 (1.7)	23 (4.3)	17 (4.0)
	219 (2.9)	*** (**.*)	*** (**.*)	204 (2.3)	*** (**.*)	*** (**.*)
Nation	22 (1.1)	30 (3.0)	33 (2.4)	24 (1.0)	27 (2.4)	20 (2.1)
	216 (1.7)	249 (6.0)	252 (2.7)	201 (1.4)	229 (4.2)	237 (3.4)
GENDER						
Male						
State	23 (1.3)	26 (1.5)	22 (1.1)	22 (1.6)	10 (0.9)	9 (0.9)
	229 (2.4)	265 (2.4)	267 (2.2)	208 (2.3)	248 (3.1)	249 (4.6)
Nation	22 (1.0)	28 (1.3)	26 (1.1)	26 (1.2)	17 (1.5)	15 (0.6)
	220 (1.5)	264 (2.1)	260 (1.5)	205 (1.6)	248 (2.8)	246 (2.3)
Female						
State	20 (1.2)	25 (1.6)	21 (1.2)	13 (1.5)	11 (1.1)	10 (1.2)
	222 (2.5)	259 (2.3)	260 (2.8)	202 (3.0)	241 (4.0)	242 (3.6)
Nation	22 (1.0)	28 (1.6)	26 (1.0)	18 (0.9)	15 (1.2)	11 (0.7)
	218 (1.8)	259 (1.9)	261 (1.4)	199 (1.6)	240 (2.4)	237 (2.1)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A34 | Eighth-Grade Students' Reports on the Number of Days of School Missed

	None		One or Two Days		Three Days or More	
	1990 Grade 8	1992 Grade 8	1990 Grade 8	1992 Grade 8	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	41 (1.1) 271 (1.6)	45 (1.1) > 277 (1.4) >	35 (1.1) 270 (1.9)	34 (1.1) 270 (1.8)	24 (1.0) 254 (2.2)	21 (0.8) 259 (2.3)
Nation	45 (1.1) 265 (1.7)	42 (1.0) 271 (1.1) >	32 (0.9) 267 (1.5)	34 (0.9) 268 (1.1)	23 (1.1) 250 (1.8)	23 (0.6) 257 (1.4) >
RACE/ ETHNICITY						
White						
State	41 (1.1) 275 (1.5)	45 (1.2) 282 (1.1) >	38 (1.1) 274 (1.4)	35 (1.2) 274 (1.5)	22 (1.0) 263 (1.7)	20 (0.8) 266 (1.9)
Nation	43 (1.2) 274 (1.7)	42 (1.3) 280 (1.2) >	34 (1.2) 272 (1.8)	36 (1.1) 278 (1.2)	23 (1.2) 259 (2.0)	22 (0.9) 268 (1.6) >
Black						
State	41 (4.8) 247 (4.7)!	43 (4.7) 242 (5.7)	27 (3.4) 238 (3.3)!	27 (3.8) 237 (4.9)!	32 (3.4) 231 (3.3)!	30 (2.4) 232 (5.2)
Nation	55 (3.1) 241 (3.2)	45 (1.9) < 241 (1.6)	21 (1.8) 242 (4.4)	32 (1.5) > 237 (2.2)	23 (2.5) 225 (3.7)	23 (1.4) 229 (2.4)
Hispanic						
State	30 (5.1) *** (**.*)	48 (6.1)! *** (**.*)	26 (5.5) *** (**.*)	28 (4.6)! *** (**.*)	45 (5.3) *** (**.*)	24 (5.2)! < *** (**.*)
Nation	41 (3.3) 244 (4.0)	35 (2.2) 251 (2.5)	32 (2.2) 250 (4.0)	33 (1.8) 247 (2.7)	27 (2.6) 234 (3.5)	31 (2.2) 236 (2.4)
TYPE OF COMMUNITY						
Adv. urban						
State	40 (2.8)! 291 (4.0)!	44 (5.1)! *** (**.*)	40 (3.9)! 289 (3.4)!	33 (5.4)! *** (**.*)	20 (2.5)! 281 (3.7)!	24 (0.5)! *** (**.*)
Nation	47 (2.3)! 286 (4.8)!	43 (2.6)! 288 (4.3)!	38 (2.6)! 278 (5.1)!	35 (2.1)! 289 (3.9)!	15 (3.7)! *** (**.*)	22 (2.3)! 272 (8.4)!
Disadv. urban						
State	34 (4.0)! 258 (6.0)!	36 (3.0)! 253 (5.7)!	32 (2.0)! 246 (7.6)!	33 (2.7)! 246 (5.4)!	35 (3.0)! 233 (4.0)!	31 (3.2)! 234 (4.2)!
Nation	42 (3.3)! 254 (4.1)!	36 (2.5) 246 (2.9)	26 (1.8)! 257 (3.7)!	33 (2.4) 239 (3.6) <	32 (2.7)! 240 (7.1)!	31 (2.2) 231 (2.9)
Extreme rural						
State	43 (3.7)! 269 (3.4)!	43 (2.7)! 282 (3.7)!	30 (3.2)! *** (**.*)	39 (2.6)! 278 (5.5)!	27 (2.8)! *** (**.*)	18 (1.8)! *** (**.*)
Nation	43 (4.4)! 257 (4.0)!	48 (2.2)! 273 (4.8)!	32 (4.2)! 265 (6.4)!	32 (1.9)! 266 (5.0)!	25 (3.9)! *** (**.*)	20 (2.2)! 256 (5.9)!
Other						
State	42 (1.3) 271 (1.7)	46 (1.4) 281 (1.3) >	38 (1.3) 270 (1.7)	35 (1.4) 272 (1.7)	21 (1.3) 256 (2.4)	19 (0.9) 267 (2.4) >
Nation	45 (1.3) 265 (2.2)	42 (1.3) 271 (1.4)	32 (1.1) 266 (1.9)	35 (1.1) 270 (1.4)	23 (1.1) 251 (2.2)	23 (0.8) 260 (1.3) >

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TABLE A34 (continued) | Eighth-Grade Students' Reports on the Number of Days of School Missed

	None		One or Two Days		Three Days or More	
	1990 Grade 8	1992 Grade 8	1990 Grade 8	1992 Grade 8	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency		Percentage of Students and Average Math Proficiency	
TOTAL						
State	41 (1.1)	45 (1.1) >	35 (1.1)	34 (1.1)	24 (1.0)	21 (0.8)
	271 (1.6)	277 (1.4) >	270 (1.9)	270 (1.8)	254 (2.2)	259 (2.3)
Nation	45 (1.1)	42 (1.0)	32 (0.9)	34 (0.9)	23 (1.1)	23 (0.6)
	265 (1.7)	271 (1.1) >	267 (1.5)	268 (1.1)	250 (1.8)	257 (1.4) >
PARENTS' EDUCATION						
College grad						
State	43 (1.5)	51 (1.6) >	36 (1.7)!	32 (1.6)	22 (1.3)	16 (1.3)
	284 (2.3)	286 (1.7)	283 (2.3)!	282 (2.4)	271 (3.2)	270 (3.0)
Nation	51 (1.6)	45 (1.2)	33 (1.2)	34 (1.2)	16 (1.3)	20 (0.9)
	276 (2.1)	281 (1.9)	277 (1.8)	280 (1.5)	266 (3.7)	271 (2.2)
Some college						
State	40 (2.5)	43 (2.6)	37 (2.6)	37 (2.9)	24 (2.1)	19 (1.9)
	275 (1.9)	277 (2.2)	272 (2.8)	272 (2.8)	261 (3.0)	269 (3.6)
Nation	40 (1.8)	42 (2.0)	37 (1.6)	36 (1.8)	23 (1.6)	21 (1.5)
	271 (2.9)	273 (1.8)	271 (2.8)	272 (2.0)	252 (3.1)	260 (3.0)
HS graduate						
State	42 (1.9)	41 (1.9)	35 (1.7)!	35 (2.1)	23 (1.8)	24 (1.5)
	260 (1.8)	270 (2.1) >	260 (2.3)	260 (2.3)	243 (3.0)	253 (3.0)
Nation	43 (2.1)	41 (1.3)	31 (1.9)	35 (1.5)	27 (1.9)	24 (1.1)
	255 (2.4)	261 (2.0)	257 (2.8)	258 (1.9)	251 (2.0)	248 (2.0)
HS non-grad.						
State	32 (4.3)	30 (3.1)	34 (3.6)	34 (3.2)	34 (3.9)	36 (3.5)
	*** (**.*)	*** (**.*)	*** (**.*)	254 (3.7)	*** (**.*)	243 (5.0)
Nation	36 (3.2)	34 (2.0)	26 (3.1)	34 (2.4)	38 (3.5)	32 (2.3)
	244 (3.2)	250 (2.9)	249 (3.6)	249 (3.7)	235 (2.9)	245 (3.5)
Don't know						
State	33 (4.8)	42 (3.9)	32 (4.1)	27 (3.6)	35 (4.2)	31 (4.1)
	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	43 (3.1)	41 (2.5)	26 (2.9)	29 (2.6)	31 (3.2)	30 (2.8)
	245 (3.7)	258 (2.4)	248 (5.9)	252 (3.6)	229 (4.6)	242 (2.9)
GENDER						
Male						
State	43 (1.4)	48 (1.5)	34 (1.2)	32 (1.3)	23 (1.1)	20 (1.2)
	273 (2.1)	278 (1.9)	273 (2.1)	272 (1.9)	258 (2.6)	264 (2.7)
Nation	47 (1.6)	45 (1.1)	31 (1.4)	33 (0.9)	22 (1.4)	22 (0.8)
	266 (1.7)	271 (1.3)	268 (2.2)	267 (1.6)	249 (2.3)	256 (2.0)
Female						
State	39 (1.6)	42 (1.3)	37 (1.6)	35 (1.5)	25 (1.5)	23 (1.3)
	269 (1.8)	276 (1.6) >	266 (2.2)	268 (2.2)	250 (2.6)	255 (2.7)
Nation	43 (1.4)	39 (1.3)	32 (1.1)	35 (1.2)	25 (1.3)	25 (0.8)
	264 (2.4)	271 (1.5)	265 (1.8)	270 (1.2)	250 (2.0)	257 (1.8) >

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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TABLE A35 | Students' Positive Perceptions and Attitudes Toward Mathematics

	Strongly Agree			Agree			Undecided, Disagree, Strongly Disagree		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	--- (--.-)	27 (1.0)	32 (0.9) >	84 (0.9)	50 (0.9)	49 (0.9)	16 (0.9)	23 (1.0)	19 (0.9) <
	--- (--.-)	275 (2.1)	278 (2.2)	227 (1.3)	267 (1.7)	270 (1.5)	207 (2.1)	256 (2.0)	260 (2.2)
Nation	--- (--.-)	27 (1.3)	32 (0.8) >	80 (0.6)	49 (1.0)	48 (0.8)	20 (0.6)	24 (1.2)	20 (0.6) <
	--- (--.-)	272 (2.0)	276 (1.2)	222 (0.9)	263 (1.7)	266 (1.0)	201 (1.2)	252 (2.0)	255 (1.6)
RACE/ ETHNICITY									
White									
State	--- (--.-)	27 (1.0)	32 (1.1) >	86 (0.8)	51 (1.0)	49 (1.0)	14 (0.8)	22 (1.0)	19 (0.9)
	--- (--.-)	280 (1.6)	284 (1.7)	233 (1.2)	272 (1.2)	275 (1.3)	217 (2.5)	262 (1.7)	265 (1.9)
Nation	--- (--.-)	26 (1.6)	32 (1.0)	82 (0.8)	48 (1.3)	48 (0.9)	18 (0.8)	26 (1.5)	21 (0.7) <
	--- (--.-)	279 (2.2)	285 (1.2)	230 (1.1)	272 (1.7)	275 (1.2)	211 (1.6)	258 (2.3)	265 (1.8)
Black									
State	--- (--.-)	28 (2.8)	34 (3.4)	78 (2.4)	51 (2.8)	51 (3.8)	22 (2.4)	20 (3.5)	15 (1.9)
	--- (--.-)	247 (3.7)!	245 (7.3)	196 (2.4)	239 (3.8)!	236 (4.2)	181 (3.9)	*** (**.*)	*** (**.*)
Nation	--- (--.-)	32 (2.5)	36 (1.7)	77 (1.5)	52 (2.3)	45 (2.0)	23 (1.5)	16 (1.9)	18 (1.5)
	--- (--.-)	249 (4.5)	245 (2.2)	195 (1.5)	234 (3.7)	236 (1.9)	178 (2.0)	229 (3.7)	223 (3.2)
Hispanic									
State	--- (--.-)	28 (4.0)	30 (4.1)!	72 (2.7)	41 (3.7)	45 (5.0)!	28 (2.7)	31 (3.9)	25 (4.5)!
	--- (--.-)	*** (**.*)	*** (**.*)	209 (3.0)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	--- (--.-)	24 (2.5)	28 (1.4)	76 (1.5)	48 (2.6)	49 (2.0)	24 (1.5)	28 (2.1)	23 (1.8)
	--- (--.-)	257 (5.5)	260 (2.1)	204 (1.4)	244 (2.5)	244 (1.7)	186 (2.3)	235 (3.5)	231 (2.7)
TYPE OF COMMUNITY									
Adv. urban									
State	--- (--.-)	28 (2.7)!	40 (4.4)!	88 (2.5)!	51 (3.7)!	53 (7.9)!	12 (2.5)!	21 (3.1)!	7 (6.4)!
	--- (--.-)	301 (3.4)!	*** (**.*)	240 (4.0)!	287 (3.0)!	*** (**.*)	*** (**.*)	274 (3.1)!	*** (**.*)
Nation	--- (--.-)	17 (3.2)!	30 (2.9)! >	86 (1.8)!	55 (2.4)!	47 (2.6)!	12 (1.8)!	28 (4.2)!	23 (2.7)!
	--- (--.-)	*** (**.*)	298 (6.0)!	242 (3.0)!	280 (4.0)!	284 (3.1)!	*** (**.*)	*** (**.*)	269 (6.4)!
Disadv. urban									
State	--- (--.-)	27 (3.0)!	33 (2.3)!	74 (1.8)	50 (2.6)!	46 (2.2)!	26 (1.8)	23 (2.8)!	21 (1.6)!
	--- (--.-)	258 (7.3)!	251 (8.8)!	200 (3.7)	244 (5.5)!	244 (4.4)!	187 (4.2)!	234 (6.7)!	237 (5.9)!
Nation	--- (--.-)	26 (2.9)!	31 (2.1)	75 (1.9)	48 (2.9)!	48 (2.7)	25 (1.9)	26 (3.2)!	21 (2.1)
	--- (--.-)	260 (5.8)!	249 (3.6)	197 (3.1)	251 (5.1)!	239 (3.6)	182 (3.2)	240 (4.4)!	226 (3.8)
Extreme rural									
State	--- (--.-)	26 (4.0)!	29 (4.7)!	89 (1.4)!	52 (3.0)!	52 (3.7)!	11 (1.4)!	22 (4.3)!	19 (3.2)!
	--- (--.-)	*** (**.*)	281 (6.2)!	231 (1.4)!	269 (3.1)!	277 (5.3)!	*** (**.*)	*** (**.*)	*** (**.*)
Nation	--- (--.-)	34 (2.8)!	32 (3.4)!	78 (2.5)	49 (2.2)!	46 (2.7)!	22 (2.5)	17 (1.4)!	22 (1.8)!
	--- (--.-)	272 (4.3)!	277 (6.7)!	221 (4.0)	252 (3.8)!	267 (4.7)!	199 (3.4)!	*** (**.*)	253 (4.1)!
Other									
State	--- (--.-)	26 (1.2)	33 (1.4) >	85 (1.2)	50 (1.1)	49 (1.2)	15 (1.2)	24 (1.3)	18 (1.2) <
	--- (--.-)	274 (1.8)	283 (1.9) >	229 (1.5)	269 (1.5)	274 (1.4)	213 (2.7)	258 (2.5)	264 (2.8)
Nation	--- (--.-)	27 (1.4)	32 (1.1)	81 (0.7)	48 (1.2)	48 (0.9)	19 (0.7)	25 (1.4)	20 (0.7) <
	--- (--.-)	271 (2.6)	276 (1.4)	222 (1.0)	263 (2.2)	267 (1.2)	204 (1.5)	251 (2.0)	258 (1.9)

(continued on next page)

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TABLE A35
(continued)

Students' Positive Perceptions and Attitudes Toward Mathematics

	Strongly Agree			Agree			Undecided, Disagree, Strongly Disagree		
	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8	1992 Grade 4	1990 Grade 8	1992 Grade 8
	Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency			Percentage of Students and Average Math Proficiency		
TOTAL									
State	--- (--.-)	27 (1.0)	32 (0.9) >	84 (0.9)	50 (0.9)	49 (0.9)	16 (0.9)	23 (1.0)	19 (0.9) <
	--- (--.-)	275 (2.1)	278 (2.2)	227 (1.3)	267 (1.7)	270 (1.5)	207 (2.1)	256 (2.0)	260 (2.2)
Nation	--- (--.-)	27 (1.3)	32 (0.8) >	80 (0.6)	49 (1.0)	48 (0.8)	20 (0.6)	24 (1.2)	20 (0.6) <
	--- (--.-)	272 (2.0)	276 (1.2)	222 (0.9)	263 (1.7)	266 (1.0)	201 (1.2)	252 (2.0)	255 (1.6)
PARENTS' EDUCATION									
College grad									
State	--- (--.-)	28 (1.4)	35 (1.6) >	87 (1.3)	53 (1.8)	49 (1.7)	13 (1.3)	18 (1.4)	15 (1.4)
	--- (--.-)	291 (2.6)	290 (2.4)	233 (2.0)	279 (2.5)	280 (2.2)	214 (3.6)	271 (2.9)	269 (3.2)
Nation	--- (--.-)	30 (2.3)	35 (1.2)	84 (0.9)	51 (1.6)	47 (1.1)	16 (0.9)	19 (1.8)	18 (0.8)
	--- (--.-)	279 (2.7)	286 (1.7)	228 (1.2)	275 (2.2)	277 (1.7)	207 (2.6)	267 (2.9)	269 (2.4)
Some college									
State	--- (--.-)	32 (2.1)	31 (1.9)	86 (2.2)	48 (2.3)	47 (1.9)	14 (2.2)	20 (1.8)	22 (1.9)
	--- (--.-)	273 (2.7)	281 (2.5)	239 (2.3)	273 (2.1)	272 (2.9)	*** (**.*)	262 (3.6)	267 (3.2)
Nation	--- (--.-)	28 (2.5)	32 (1.6)	84 (1.9)	47 (2.4)	50 (1.8)	16 (1.9)	25 (1.8)	19 (1.6)
	--- (--.-)	276 (3.5)	278 (2.3)	226 (1.8)	267 (2.3)	269 (2.0)	205 (4.5)	258 (2.9)	260 (3.0)
HS graduate									
State	--- (--.-)	25 (1.7)	31 (1.6)	88 (1.6)	49 (1.6)	49 (1.6)	12 (1.6)	26 (1.7)	20 (1.5)
	--- (--.-)	262 (2.0)	269 (2.7)	223 (1.6)	258 (1.7)	261 (1.8)	*** (**.*)	249 (3.1)	254 (2.8)
Nation	--- (--.-)	27 (2.1)	31 (1.3)	81 (1.7)	47 (2.3)	48 (1.5)	19 (1.7)	26 (2.0)	21 (0.9)
	--- (--.-)	263 (3.1)	264 (2.0)	216 (1.9)	255 (2.4)	255 (1.7)	200 (3.3)	246 (2.1)	247 (2.5)
HS non-grad									
State	--- (--.-)	18 (2.6)	28 (3.3)	81 (4.0)	46 (4.5)	52 (4.0)	19 (4.0)	35 (5.2)	21 (3.4)
	--- (--.-)	*** (**.*)	*** (**.*)	214 (3.6)	251 (5.0)	254 (3.6)	*** (**.*)	*** (**.*)	*** (**.*)
Nation	--- (--.-)	20 (2.6)	28 (2.5)	71 (3.3)	50 (3.3)	46 (2.4)	29 (3.3)	30 (3.6)	26 (2.0)
	--- (--.-)	*** (**.*)	257 (3.6)	208 (2.5)	241 (2.7)	250 (2.3)	191 (4.6)	237 (4.6)	237 (2.6)
Don't know									
State	--- (--.-)	16 (3.9)	30 (3.8)	79 (1.5)	56 (4.3)	46 (3.9)	21 (1.5)	28 (4.9)	24 (3.5)
	--- (--.-)	*** (**.*)	*** (**.*)	219 (1.7)	240 (5.5)	*** (**.*)	203 (3.2)	*** (**.*)	*** (**.*)
Nation	--- (--.-)	18 (2.5)	26 (2.2)	77 (1.1)	47 (3.6)	48 (2.2)	23 (1.1)	36 (4.2)	26 (1.6)
	--- (--.-)	*** (**.*)	263 (3.1)	216 (1.2)	241 (3.2)	251 (2.1)	198 (1.7)	233 (4.9)	242 (3.6)
GENDER									
Male									
State	--- (--.-)	27 (1.3)	34 (1.1) >	83 (1.2)	52 (1.4)	47 (1.0) <	17 (1.2)	22 (1.5)	20 (1.4)
	--- (--.-)	278 (2.7)	282 (2.7)	228 (1.7)	270 (1.9)	272 (1.6)	208 (2.4)	258 (2.6)	262 (2.6)
Nation	--- (--.-)	28 (1.5)	32 (1.2)	80 (0.7)	48 (1.2)	48 (0.9)	20 (0.7)	24 (1.4)	21 (0.9)
	--- (--.-)	273 (2.5)	276 (1.6)	223 (0.9)	263 (2.0)	265 (1.3)	201 (1.8)	251 (2.9)	255 (2.0)
Female									
State	--- (--.-)	27 (1.2)	31 (1.6)	85 (1.2)	49 (1.2)	51 (1.4)	15 (1.2)	24 (1.2)	18 (1.2) <
	--- (--.-)	272 (2.5)	275 (2.5)	225 (1.5)	264 (2.0)	268 (1.9)	206 (2.9)	254 (2.7)	258 (2.6)
Nation	--- (--.-)	26 (1.7)	32 (1.0) >	81 (0.9)	50 (1.7)	47 (1.1)	19 (0.9)	25 (1.9)	20 (0.7)
	--- (--.-)	270 (2.4)	275 (1.6)	220 (1.2)	262 (2.0)	266 (1.3)	201 (1.7)	252 (1.9)	256 (2.5)

The NAEP mathematics scale ranges from 0 to 500. The standard errors of the statistics appear in parentheses. It can be said with about 95 percent confidence that, for each population of interest, the value for the entire population is within ± 2 standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference (see the Procedural Appendix for details). If the notation > (<) appears, it signifies that the value for 1992 was significantly higher (lower) than the value for 1990 at about the 95 percent confidence level. --- "Strongly Agree" and "Strongly Disagree" were not response choices for Grade 4. A "perception index" of 1 represents very positive perceptions toward mathematics and a "perception index" of 3 represents uncertain or negative perceptions toward mathematics. ! Interpret with caution -- the nature of the sample does not allow accurate determination of the variability of this statistic. *** Sample size is insufficient to permit a reliable estimate (fewer than 62 students).

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The design, development, analysis, and reporting of the 1992 Trial State Assessment was a continuation of the collaborative effort that began in 1989 among staff from State Education Agencies, the National Center for Education Statistics (NCES), Educational Testing Service (ETS), Westat, and National Computer Systems (NCS). The Trial State Assessment Program continued to benefit from the contributions of hundreds of individuals at the state and local levels -- Governors, Chief State School Officers, State and District Test Directors, State Coordinators, and district administrators -- who provided their wisdom, experience, and hard work.

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The large number of states and territories participating in the Trial State Assessment provided many challenges, including the need to develop different reports, customized for each of the 44 participating jurisdictions based on its characteristics and the results of its assessed students. To meet this challenge, a computerized report generation system was employed that created text, tables, and graphics for each jurisdiction's unique report. This system was designed to take advantage of mainframe computer speed and accuracy for the data computations, interfaced with high-quality text formatting and graphical output procedures. Jennifer Nelson created the system and led the computer-based development of the report with the able assistance of Laura Jerry. John Mazzeo oversaw the analyses for the reports. John Ferris, David Freund, Bruce Kaplan, Edward Kulick, Phillip Leung, Spencer Swinton, and Hua Chang collaborated to generate the data, conduct the analyses, and check the results. They were assisted by Drew Bowker, Fai Fong, Craig Pizzuti, and Ira Sample. Al Rogers developed and generated the maps.

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